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PRACTICAL APPLICATIONS OF HEREDITY

PRACTICAL APPLICATIONS
of
HEREDITY

By
PAUL POPENOE

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By PAUL POPENOE

APPLIED EUGENICS (in collaboration with Roswell H. Johnson). Also published in a Japanese translation.

MODERN MARRIAGE—*A Handbook.*

THE CONSERVATION OF THE FAMILY.

PROBLEMS OF HUMAN REPRODUCTION

STERILIZATION FOR HUMAN BETTERMENT (In collaboration with E. S. Gosney.) Also published in a German translation.

THE CHILD'S HEREDITY. Also published in a German translation.

PREFACE

Most of the essays which are here brought together in a revised form, originally appeared in *The Journal of Heredity*, *The Scientific Monthly*, and *Eugenics*, and I am much indebted to the editors of those publications for permission to use the material again in a book.

The abundant citations to sources, which accompanied their original publication, are omitted in this book, as likely to be of little interest to the general reader. Those who are interested in verifying some of the statements made, or in seeking further details, can get the references from the original periodical publication.

No attempt has been made to give a systematic treatment of the subject covered by the title of this book, because I have done this, as fully as the present progress of genetics will permit, in my book, *The Child's Heredity*. For an organized account of heredity in its relation to education, the reader should consult that work: the present one forms rather a series of footnotes to it.

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I

WILL YOUR SON BE A GENIUS?

Who was the brightest child that ever lived?

Every parent knows the answer. Others must look to the pages of history.

Christian Heinrich Heineken of Lübeck had committed to memory the best stories in the Pentateuch at 12 months; two months later he had added the other books of the Old Testament and all those of the New; at 15 months he was taken before the king and piped up, with a respectful obeisance, "Permit me, sir, to kiss the hand of your majesty and the hem of your royal garment." At four years he could read but not write; he could add, subtract, multiply, and divide; he knew French and had learned 1500 sayings in Latin; had picked up Low German from his nurse; and remembered the most important facts about towns and localities all over Europe. It will not surprise some readers to learn that he died at the age of four years and four months. However, he had always been sickly.

The achievement of some contemporary children is almost equally high, though perhaps few of them are rewarded as was Thomas Arnold of Rugby who, while an infant, made such a creditable record for scholar-

ship that on his third birthday his father gave him Tobias Smollett's *History of England* in 24 volumes.

Martha S., according to her father's report, was given a book and pictures at the age of 19 months, knew small and capital letters perfectly 30 days later, and after a few days instruction at that time began to pick out simple words from the printed page. At 24 months she had a reading vocabulary of over 200 words.

Betty Ford became interested in the typewriter when three years old; in 90 days she learned to type and thus to read; by her eighth birthday she had read 700 books, many of them twice, and for two years had made it a practice to read at least eight hours a day. At the age of 30 months she began to make up little stories about animals, at 33 months rhymed jingles. At the age of eight she had a vocabulary of 13,000 words, which is the average of Stanford University freshmen, and was turning out literary productions—stories and poems—that compared favorably with those of Stanford upperclassmen and were ranked above those of the child Percy Bysshe Shelley. Her IQ at this age was 188.

Edward Rochie Hardy, Jr., had the same IQ at the same age; at 11 he passed the Harvard University entrance examinations, at 12 those of Columbia University, standing second among 483 candidates whose median age was 18.

The childhood of eminent men is in some ways more interesting, because one knows what they did in after life. The early history of 300 of them has been made the subject of detailed study by Catherine M. Cox. So far as the records go, it looks as if the palm must be awarded to John Stuart Mill, the English economist. He "had no childhood; his interests and activities were mature from the first." He began to learn Greek at three, read Plato at seven, was mastering conic sections at nine; and the rest of his youth was cut from the same pattern. The facts seem to warrant assigning him an IQ of not less than 190.

But since the IQ to be assigned to these early geniuses depends largely on the amount of information available, backers of other candidates can make out cases for their own favorites. Several others are rated by Dr. Cox and those who assisted her at 180 to 190; hence if more facts were to be had they might equal or exceed John Stuart Mill.

Jeremy Bentham, the English jurist and utilitarian philosopher, comes in this group. He learned the alphabet before he could talk; at four and five he was writing little compositions in Latin and Greek; at 10 he was ready to enter Oxford University. "Before he was three and one-quarter Jeremy took a walk with his parents and some friends, and finding that the conversation was about matters of indifference to him, he escaped and ran home. Ringing the bell,

he gave orders to the footman to put the reading desk on the table and place a large folio, Rapin's *History of England*, upon the desk, and to provide candles without delay. His parents came home to find him absorbed in his reading," of an author whom Thomas Babington Macaulay used as a synonym for dulness.

Lord Macaulay himself has long been famed for his precocity. At three he read incessantly; at four he carried away a mental catalog of the Oxford collection after a single visit to it. Before the age of seven he wrote a compendium of universal history, from the Creation down; within a year or two more he had written a long heroic poem, a discussion of the merits of Christianity, and other articles too numerous to mention.

Blaise Pascal, French geometer and philosopher, falls in the same class. He practically created mathematics for himself, because his father, who was likewise a gifted mathematician, tried to prevent him from studying it until after he had mastered the languages. He "wanted to know a reason for everything"—a characteristic that many parents will recognize as significant.

Johann Wolfgang Goethe stands perhaps a little higher, even, than the youths just mentioned. In early manhood his achievements were so great that Dr. Cox, a former teacher of the German language and literature, asserts that "his true IQ may in the history

of mankind have been equalled in a few instances; one may well wonder whether it has ever been exceeded." If this is true, it confirms the opinion of many maidens, that even the wisest man in the world, in dealing with women, is likely to make a perfect fool of himself.

Hugo Grotius, founder of international law, comes close to Goethe in the promise of childhood. Gottfried Wilhelm Leibnitz, the philosopher and mathematician, is their worthy rival. "Grotius, Leibnitz, and Goethe, three universal geniuses, the evidence of whose overpowering intellect appeared and was recognized in earliest childhood as it was later in youth, are doubtless among the greatest minds with which this study is concerned. A minimum childhood IQ for these cannot be less than 180. A maximum is probably close to the maximum for the human race."

Yet even these do not exhaust the possibilities. F. M. A. de Voltaire, the Comte de Mirabeau, George Berkeley, Humphry Davy, Philipp Melanchthon, F. W. Schelling, and others are handicapped by the paucity of information concerning their childhood. If the facts were known, Dr. Cox thinks they might well have ranked, as those already named would perhaps have done, at 200 or above. At the age of two, they were as far advanced as the ordinary child of four; at five, they equaled the accomplishments of the average 10-year-old.

There are still others whom the book does not mention,—for instance, Francis Galton, whose childhood IQ, as judged by the facts given in the biography by Karl Pearson, can not have been much short of 200.

Such cases are indeed rare, yet since the art of mental testing became popular in recent years, a few parallels have been found. One girl has even been assigned an IQ of 214—the highest on record. Will she, a generation or two hence, be ranked above Charlotte Brontë, George Eliot, Mrs. Gaskell, Mme. de Maintenon, Harriet Martineau, George Sand, Mme. de Sevigné, Mme. de Stael,—the eight women included in the list of 300 geniuses?

Dr. Cox thinks that anyone with a childhood IQ above 150 is certain, barring accidents, to make a mark in the world; but of course the attainment of eminence depends on many other things than the mere intellectual brightness which is the principal thing measured by the IQ. In any man's or woman's achievement, there are always at least three major components—ability, drive, and opportunity; their proportions in each achievement vary, but if any one of them is lacking, the individual is handicapped.

Some of the heroes of history have not been extraordinarily brilliant intellectually, and some of those recorded in this study had a childhood IQ not much above mediocrity (that is, 100); although it must always be remembered that if more facts were known,

the rating assigned would probably be higher. Thus the study does not pretend to say what the true IQ of each individual was; it merely states what IQ is necessary to account for the facts, so far as they are known.

At the bottom of the list are Jean de la Fontaine, André Massena, and Sebastian de Vauban, with IQ of only 100. At a step higher (105) one finds John Bunyan, Miguel de Cervantes, William Cobbett, James Cook, Nicolas Copernicus, Francis Drake, Mehemet Ali, Nicolas Poussin, and Gouvion de St. Cyr, together with such a real genius as Michael Faraday. The list of IQ 125 begins with Joseph Addison and ends with George Washington; running through Justus Liebig, Abraham Lincoln, Carolus Linnaeus, and John Locke, to name but a single letter of the alphabet.

Every small college has numerous students with higher IQ than this, yet few small colleges will turn out a quartet of alumni who will accomplish more in the world than Liebig, Lincoln, Linnaeus, and Locke. The search for the further facts in the making of genius takes up much of Dr. Cox's book, and leads her to the following conclusions:

1. Youths who achieve eminence have, in general, (*a*) a heredity above the average, and (*b*) superior advantages in early environment. The factor last-named is by no means sufficient, as some have sup-

posed, to account for their success, however; for there have been many other children, including the brothers and sisters of the geniuses, who failed to reach the same heights. On the other hand, an occasional genius arises from the most unpromising surroundings, as the son of a tinker (John Bunyan), of a stonecutter (Antonio Canova), of a mason (Thomas Carlyle), of a strapmaker (Immanuel Kant), of a tanner (Louis Pasteur), of a day laborer (James Cook), or of a peasant (Cornelis Jansen). Nor will the early educational opportunities furnish the key to the problem, for those possessed by J. J. Winckelmann, Michael Faraday, Abraham Lincoln, or Gebhard L. von Blücher apparently were not favorable to success. Heredity has the final decision.

2. Youths who achieve eminence are distinguished in childhood by behavior which indicates an unusually high IQ. The self-styled Voltaire wrote verses "from his cradle;" S. T. Coleridge at three could read any chapter from the Bible; W. A. Mozart composed a minuet at five; and so on. "The significant conclusion in the present study is that the extraordinary genius who achieves the highest eminence is also the gifted individual whom intelligence tests may discover in childhood. The converse of this proposition is yet to be proved."

3. "That all equally intelligent children do not as adults achieve equal eminence is in part accounted

for by our last conclusion: youths who achieve eminence are characterized not only by high intellectual traits, but also by persistence of motive and effort, confidence in their abilities, and great strength or force of character." Since the IQ is, so to speak, inborn, it is in these last respects that education has its principal opportunity to produce valuable citizens.

This opportunity the public schools have scarcely even thought of grasping. They expend almost all their energy on the intellect, which would largely take care of itself; disregarding the great possibilities awaiting an educator in the direction of inculcating a love of truth, habits of diligence, and a well-nourished imagination. All these things are at least as necessary to success in life as the ability to tell the exact location of Cape Guardafui, or to translate from the original Latin the specifications of a wooden bridge which Julius Caesar built across the Rhine in 54 B.C. Whether they can be learned anywhere except in the home remains to be seen. If the schools can not succeed in this department of education, they will have little excuse for taking the child away from the parents, and parents will have even less excuse for thrusting the education of their offspring wholly into the hands of hirelings.

The fact that the conventional school curriculum has (at least until quite recently) been so ill-adapted to a superior child, has caused many such children to

despise it and to make an unsatisfactory showing. This has in turn led to the remarkable idea that many men who afterward turned out to be geniuses have been stupid children.

For such an idea there is no warrant whatever. Least of all is it a fair inference from the fact that the school course was so much below the abilities or foreign to the interests of these children, that they refused to make an effort in it. Such an attitude might be considered creditable to them; certainly it is not an evidence that dulness and brilliance are mixed together in the same mind, like the streaks of chocolate and vanilla in a marble cake.

Thomas A. Edison was usually at the foot of his class in grammar school. One of his teachers spoke of him as "addled." His mother finally took him out and taught him herself, whereupon he made prodigious strides. The experience of Pierre Curie was similar. Charles Darwin was considered dull; Carl von Linné (the botanist Linnaeus), while studying for the ministry, did so badly in the important subjects of morality, theology, metaphysics, and Hebrew, that he was advised to become a mechanic, as he did not have the brains to succeed in an intellectual pursuit. Samuel Johnson, Jonathan Swift, William Wordsworth, were all stigmatized as indolent and of slight ability; and teachers doubted whether Alexander von Humboldt possessed normal intelligence.

Heinrich Heine failed in school. Tradition ascribes to David Hume's mother the judgment, "Our Davie's a fine, good-natured cratur, but uncommon wake-minded." James Russell Lowell, Richard Wagner, Louis Pasteur, William Ewart Gladstone, and many another, in their childhood, fitted so ill into the iron-clad school system, which they found did not suit either their needs or their interests, that they were looked upon as mediocrities. Jean de la Fontaine was pronounced by his teachers "a well disposed but hopeless dunce." William Warburton, the English theologian, was remembered by his first schoolmaster as "the dullest of all dull scholars." The only pleasant memory Martin Luther had of his early schooling was the singing of hymns. Oliver Goldsmith's first teacher stated that "never was so dull a boy;" another and later one called him "a heavy, stupid blockhead."

In the case of poor Noll, however, there was perhaps some excuse, for even in adult life he was something of a simpleton in many ways—he was, for instance, capable of arguing, not only with conviction but with heat, that when he chewed his lower jaw did not move down and up, but his upper jaw moved up and down.

Francis Galton, founder of eugenics and a pioneer in the scientific study of heredity, hated his early schooling and felt that it was largely a waste of time, or worse. "I had craved what was denied," he

wrote in his autobiography, "namely, an abundance of good English reading, well taught mathematics, and solid science." On the other hand, one of his early teachers complacently wrote to the parents of this young genius, "He will, I think, do well, for though he does not entertain all the horror of false quantities or all the admiration of Greek accents which are felt by some of his fellows, he is docile and willing to submit to occasional correction."

It would be easy to fill the rest of this book with evidence of the colossal failure of the educational system to meet the needs of the superior child: I shall content myself with a final example drawn from a different part of the globe. Muhammad 'Abdu, the grand mufti of Egypt (died 1905) was one of the greatest men whom modern Islam has produced. He did not know how to read until he was 10. Sent to the Ahmadiyah mosque at Tanta, he learned nothing in an entire year. He wanted to become a farmer and ran away disgusted to his home. His father returned him on horseback in charge of a man whom Muhammad evaded, galloping off and letting the horse have his head. This landed him in a near-by village where lived an uncle who grasped the situation, took the boy in, and for four years taught him, laying the foundation of a scholarship that would have ornamented any country in the world.

In short, the fact that many great men have not

distinguished themselves in their early schooling proves nothing except the incompetence of their teachers. It is worth while to review the facts here, because of a widespread misconception. Even among college students, more than half of a group recently questioned agreed with the statement, "Many eminent men have been feebleminded as children."

Finally, the objection is often raised: if genius is dependent on heredity, why do not great men more frequently have great sons? Who remembers even the existence, much less the name, of a son of Pericles, Thucydides, Socrates, Themistocles, Cicero?

The answer is, in the first place, that they do have great sons much more frequently than do ordinary men; and that their sons, as a whole, average much higher than do those of an ordinary lot of men. But the particular combination of characters which makes genius is of necessity so rare that it can not often occur. Every child inherits from two parents alike: his father and his mother. One of these, it is here supposed, is a genius, but what of the other? When Goethe wedded his serving woman, is it surprising that he had a son and two grandsons whom it is kindest to forget? When Napoleon married into the Austrian royal family, shot through and through with biological defects, is it astonishing that the "King of Rome" was a sickly nonentity? Commodus was the

son of Marcus Aurelius, but also, and more conspicuously, of his wife and cousin, Faustina.

Again two persons may marry, each of them having the highest talent; yet if this talent was sporadic, due to a lucky combination of traits, it may not perpetuate itself. It is millions to one against the child getting an equally favorable combination of genes. Thus when Robert Browning married Elizabeth Barrett Barrett, one might have expected the production of wonderfully gifted children. Their son was an estimable gentleman whom his best friends probably never asserted to be a genius.

There is a story circulated by the Shavian press bureau which points the moral neatly. A Parisian beauty said to the dramatist, "Oh, Mr. Shaw, you and I should have married each other. Inheriting your brains and my beauty, think what our children would have been!" To which G. B. S. replied, "Ah, madame, I fear they might have inherited your brains and my beauty."[1]

Negative examples alone should not be counted: every one of them can be matched by one that tells in the opposite direction. Philip of Macedon begat Alexander. The Earl of Chatham (himself a precocious genius who at the age of 20 took his B.A. with

[1] Thus succinctly described by his friend Wilfred Scawen Blunt, in *My Diaries*: "He is an ugly fellow, too, his face a pasty white, with a red nose and a rusty red beard, and little slatey-blue eyes."

a double first at Oxford) was the father of "the younger Pitt," one of the youthful geniuses of history —a cabinet minister at 23, premier of Great Britain at 24. True, the boy came of a family that had been wealthy and distinguished on both sides for generations; true, he inherited a name which at the time of his birth was perhaps the most influential in the world (though the family title and estate went to his mediocre elder brother). Grant that "pull" helped him to enter parliament at 20 and facilitated his access to the cabinet; yet could "pull" have made him what he was in his undergraduate days, one of the foremost scholars in Great Britain?

On this point, no one was better qualified to pass judgment than Lord Macaulay, who describes the youth's entrance to college at 15, his reception of the degree of Master of Arts at 17, and the three following years which he passed in study. "The work in which he took the greatest delight was Isaac Newton's *Principia* [a work which not one modern Ph.D. in a hundred can even read]. His liking for mathematics, indeed, amounted to a passion, which in the opinion of his instructors, themselves distinguished mathematicians, required to be checked rather than encouraged. The acuteness and readiness with which he solved problems was pronounced by one of the ablest of the moderators . . . . to be unrivaled in the University. Nor was the youth's proficiency in

classical learning less remarkable . . . It may be doubted whether any scholar has ever, at 20, had a more solid and profound knowledge of the two great tongues of the old civilized world. The facility with which he penetrated the meaning of the most intricate sentences in the Attic writers astonished veteran critics. He had set his heart on being intimately acquainted with all the extant poetry of Greece, and was not satisfied until he had mastered Lycophron's *Cassandra*, the most obscure work in the whole range of ancient literature. This strange rhapsody, the difficulties of which have perplexed and repelled many excellent scholars, 'he read,' says his preceptor, 'with an ease at first sight which, if I had not witnessed it, I should have thought beyond the compass of human intellect.'"

Apart from extremely rare sporadic instances, the appearance of genius can be explained first by the character of the parents, secondly by the character of the stocks from which they come. When the parents are eminent but come of mediocre stocks, the pull of the more remote ancestry will be so great that, in the shuffling of the chromosomes and distribution of the genes, it will be unusual for a child to be as well endowed as they were. Every gene has an alternative; every child has an equal chance of getting the alternative. Unless this alternative is identical with its mate—that is, unless the child has inherited

this desirable gene from both sides of his ancestry—he will get something that is not "just as good."

When, however, the parents come from stocks which have for generations been highly endowed, their children are almost certain to be above the average.

The appearance of sporadic genius is in itself an argument for the inborn nature of genius. It is only once in many million times that such a favorable combination of genes can be anticipated, in ordinary stocks, as to produce this result.

The failure of the sons of great men to be always as great as their fathers is another testimonial to heredity. If greatness were merely a matter of education, influence, and opportunity, the son or even the protege of any great man ought to go to the top. Richard Cromwell's fame should have surpassed that of his father the Protector; the scholarch Speusippus should have reflected more glory on the Academy than did his uncle Plato.

II

HEREDITY AND THE "INFANT PRODIGY"

A nine-year-old boy from Vermont stood before the Duke of Cambridge.

"Give the number of seconds since the beginning of the Christian era, 1813 years 7 months and 27 days," he was told.

The child thought a moment. "57,234,384,000," he replied.

Zerah Colburn was one of the most perfect specimens of child prodigy along arithmetical lines. His facility was noticed when he was about six years old and was playing on the floor one day. His father heard him repeat to himself what sounded like parts of the multiplication table. He had not been taught this, and presumably had picked up the information from other children.

The father was interested, and began to ask questions. Soon he said, "What are 13 times 97," and instantly came back the correct answer, 1261.

The child later extracted square and cube roots mentally without hesitation and, being asked by the Duke of Cambridge to raise the number 8 to the 16th power, did so with only a minute's thought, although the answer ran into hundreds of trillions. At this time he was not an educated boy—he had learned to

read and write, and that is about all. But he is said to have been a wide and interested reader.

He was taken to Europe and exhibited. Napoleon, who had just then returned from Elba, sent him to the Lyceum Napoleon in Paris to continue his education. He was afterward schooled in London, became a teacher and a methodist preacher, and ended as professor of languages at the University of Vermont, giving instruction in Greek, Latin, French and Spanish. His mental powers declined rapidly and he died at the age of 38, a man of very ordinary intellectual capacity.

Here is a case that presents some interesting problems (one of them, incidentally, being his inheritance through four generations of six digits on each hand and foot). As a child Zerah was considered dull, definitely inferior to his five older brothers and sisters. If tradition (supplemented by his highly conceited autobiography) is to be trusted, he blazed out like a comet, and then declined with almost equal speed.

Can his career be attributed to the influence of his surroundings? Evidently not. He was certainly no hot-house product, no forced prodigy as have been some other "child phenomena." On the other hand, is it possible that such a peculiarity is inborn; if so, why did it disappear?

It is impossible to answer these questions definitely.

Some light on the general problem has been thrown by the study of other lightning calculators.

One of these, who has appeared on the vaudeville stage for many years, and who is designated in the examination as K, claimed to have a ready command of the following assortment of facts:

1. The population, by the 1920 census, of every town and city over 5,000 in the United States. (He had previously learned the population of all towns over 2,000 by the 1910 census, but this obsolete information he was now "trying to forget.")

2. The names, number of rooms, and location of about 2,000 leading hotels in the United States.

3. The county seats of all counties in the United States.

4. The population of 1800 leading foreign cities.

5. The distances of all cities in the United States from New York and from Chicago, and also the distance from each city or town to the largest city in its state.

6. Statistics concerning 3,000 mountains and rivers.

7. The dates and essential facts connected with over 2,000 leading inventions and discoveries.

Tests showed that his claims were substantially correct, and that he also had a vast "unclassified" stock of facts from geography and history. He had learned his associations both ways; he would give the popu-

lation of a city if its name was called, and he also made such a record as the following, when the mere numbers were called:

Q. 74,684.
A. San Diego, Calif.
Q. 83,252.
A. Savannah, Ga.
Q. 8,481.
A. Coshocton, Ohio.

The striking thing in K's equipment is not the total number of facts, which is doubtless exceeded by many well-informed persons, but the classification of them, and the fact that they presented no natural associations, and thereby taxed his memory the more. He had gone over his facts so often that he could break them up in many peculiar ways, and the performance was well adapted to "astonish the natives" on a vaudeville circuit.

One of the standard intelligence tests measures memory span, that is, the number of digits that can be recalled after a short interval. In general, the average child can do, at the ages stated, the following:

	AGE													
	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Number of digits that can be repeated.....	4	4	5	5	5	6	6	6	6	7	7	7	7	7

K was given the number 4836179621, which he studied for 35 seconds, and was able to reproduce correctly after a four-hour interval. Few adults could accomplish this. Does it show a particular gift of memory?

Apparently not. K described his method as follows:

"When I saw this number, I read it as 4,836,179,621. I remembered 4 because of the 4th of July. 836 I just had to memorize, without any help, but if I were doing it again it would probably occur to me that 836 was the Chinese population of the state of Texas in 1910, and then I wouldn't forget it. 179 is easy to remember because it is the number of miles from New York to Harrisburg, and 621 is the number of a house I know of in Denver."

By these linkages he was able to reduce the number of units from 10 to 4. Probably there is no other way of remembering large figures. Abundant tests have shown that the memory span is fixed and constant for each individual, and that it is not improved with practice. The only way it can be exceeded is by the use of some such device as that of K.

Men of science sometimes enjoy demonstrating such systems, the best known in the United States being that of the psychologist, Arthur S. Otis. Some of the records would be incredible if not well attested. A Norwegian philologist, Paula Bergh, learned 408

figures in 104 minutes, thereby taking the record which was previously held by Diamondi, a "professional" studied by Alfred Binet. His limit was about 200 figures, which he learned in 75 minutes, and reproduced correctly in writing.

Dr. Bergh's record, however, was quickly broken by G. Rückle, a German mathematician, who learned a series of 504 figures in 40 minutes. All of these learned visually. Dr. Rückle groups the figures in associations which he can see mentally. Dr. Bergh has not, as Dr. Rückle has, a particular fondness for figures; she is not mathematically inclined, nor even good at calculation. Her habits of mind being more literary, she individualizes the figures as persons, places, or objects, and then builds in her mind a whole landscape. By looking at this, she can describe it, thereby reading off the figures.

It is unfortunate that a scientific description is not available of the working of the mind in some of the historical families celebrated for good memories, as that of the classical scholar, Richard Porson. The biographies of Chinese literati ought also to furnish some extraordinary material on memory. Marcus Annaeus Seneca could repeat 2,000 words in the order in which he heard them, if historians are to be trusted; his son Lucius was also, though less highly, gifted in this respect. When 350 words were read to Paula

Bergh, with 8 seconds allowed for the study of each, she repeated the whole series at once with only 11 per cent failures, and even after a year, in which she had given it no further thought, she was still able to recall one-third of the words.

From such studies as these, it is inferred that there is no special "memory for figures" nor any other specific capacity of that sort; the achievement requires only the capacities that are used in other kinds of learning; but quite unusual amounts of some of them such as concentration and lack of fatigability. On the other hand, the visual fantasy that seems to make the most astonishing achievements possible is possessed by few, and can hardly be cultivated by those who do not possess it. It recalls the families discovered by Francis Galton, members of which always thought of figures in definite patterns or frameworks, which were sometimes represented to the mind's eye in colors. He believed that this peculiarity was inherited, as in several instances the offspring did not know that the parent also possessed it; but the whole subject needs to be restudied to verify this conclusion.

K is not, broadly speaking, an intelligent man. He was 38 years old at the time of the examination, but tested 11 years and 10 months mentally, which gives him an IQ of 74 and puts him among the "borderline" group, just above the moron, but not definitely normal,

not even dull normal. In general tests of logical memory he was not even as good as the average normal.

How, then, is his "talent" for memorizing to be explained? Is it a case where an individual with few gifts in general is compensated by a particular gift in one direction, as Ralph Waldo Emerson would have opined? The examiner in this case believes not. He traces K's early history, showing that he is physically defective, did not adjust himself well in school because of his retarded mentality, his markedly effeminate manner, and a speech impediment. He tended, therefore, to isolate himself from the world about him and to live in a world of fantasy, in which he attempted to compensate for his inferiority in general by believing that at least he had a great superiority over other children in one respect: he would be a "memory artist."

This explanation holds, in short, that the compensation was not provided by nature, but was one worked up by the subject for himself. This is the only kind of compensation of which anything is known scientifically.

But why, one might ask, did K pick out this particular field in which to compensate for his inferiority complex? He might have done it in any one of a thousand other directions. Most people are compensating or over-compensating to themselves for

some real or imagined inferiority,[1] and few end as "memory artists." Is it not likely that his compensation took this form because nature had given him a start in this direction? This supposition is made the more plausible by the admission that "K received much encouragement from his mother, who regarded herself as possessing unusual memory abilities, and liked to think of her son as following in her footsteps."

The same sort of explanation must be applied to other cases which have been interpreted too superficially, merely as the product of mental mechanisms. These mental mechanisms must have a physical basis to work on, and this physical basis is provided by the peculiarities of the subject's inherited constitution.

There are many cases on record of memorizing ability associated with mental defect. The opinion has often been expressed that "phenomenal" memory may be associated with idiocy. Some of these cases have been examined carefully in recent years.

For instance, "Mark, a 19-year-old boy at Letchworth Village, has a remarkable memory for and recalls with facility anything that has been taught him—

[1] The inferiority complex is to be looked upon as a normal part of human mentality—the reaction of an organism that is never perfect, toward the overwhelming forces of nature and mankind against which it must battle continually. Investigation shows that it is more pronounced among women than among men. This is probably associated with a neurotic constitution, introversion, and social limitations.

dates, names, places, or events. Geographical names of obscure and little-known places, dates of significant or insignificant historical events, names of important or unimportant persons, if once known are never forgotten." He is a characteristic mental defective, but not of low-grade.

Eugene Hoskins, a pure black in Mississippi, has, on the contrary, a mental age of only eight. His auditory memory span is relatively short—he failed on five digits, which a normal six-year-old should repeat. By sheer effort, however, Eugene has committed to memory a large array of facts relating to dates, places, and particularly locomotive numbers. In the years 1921–4, given the month, day, and year, he will at once name the day of the week; or if given the year and month, and asked what day of the month was the second Tuesday, or the fourth Friday, he never fails. At the time of the examination he was extending this ability to the year 1925.

In this case it is clear that the information was acquired merely by hard work, and the explanation offered is that he had not enough sense to know any better. If he had been normal he would not have been willing to spend all his effort on acquiring useless information.

This explanation is acceptable so far as it goes, but again it seems to fall short. Such cases as that of Mark, and many others in the older literature, indi-

cate that there may be inherited differences in memorizing ability, and that these are inherited more or less independently of general intelligence. Such a supposition does not involve the supposed Law of Compensation lauded by philosophers; it merely involves the fact, well attested in all studies of heredity, that to a large degree different traits may be inherited independently. Correlation exists, but it is often not a high correlation. As a fact, tests have demonstrated that memory has little or no correlation either with general intelligence or with school standing.

How is it, then, with Zerah Colburn, the boy prodigy? He performed, untaught, feats that are quite impossible for the brightest boy. It is open to question whether any bright boy could be taught to extract the cube root of 268,336,125 mentally, or to give the square root of 998,001 in four seconds, as Zerah did.

If it is true that he was considered dull as an infant, it is conceivable that he worked up his ability as a calculator, in an effort to compensate for this reputation, and thus to satisfy self-esteem, which was large. It is conceivable that he was gifted with a memory much above the ordinary, which aided him. It is conceivable that he really was extremely bright, and that his early decline was due to some mental disease.

Such speculations do not solve the problem, which at present must be left unsolved. When all the facts are considered, however, it is difficult to believe that

any explanation is satisfactory, in the case of prodigies, which fails to take account of real, inherited differences, in such mental functions as memory and calculating ability.

In other words, such performances require not only a "system," but also a "gift."

That the gift comes before the system is indicated by the traditional origin of the system, which the ancients ascribed to Simonides of Cos (556–468 B.C.), who was not only a classical poet of repute, but perhaps the first poet to commercialize his art. He was the man to whom every wealthy parvenu turned for the contribution of a suitable epitaph, or a couplet to celebrate success at the Olympic games. In his youth (Marcus Tullius Cicero tells the tale in his essay *De Oratore*) Simonides, who was attending a banquet, went out, whereupon the roof fell, killing the whole company. When the debris was cleared away the bodies were found to be crushed beyond recognition; Simonides identified them all, however, because he remembered their positions. This called his attention to the fact that order or arrangement is the greatest aid to memory. The most expensive correspondence course in memory training, at the present day, has gone little farther than the discovery of Simonides.

Various kinds of complementary evidence enforce the conclusion that mathematical talent (which itself

embraces a large number of diverse capacities, not yet fully analyzed, about whose independent inheritance little or nothing is known), is dependent primarily on inheritance.

1. It runs in families, as that of the Bernouillis, which produced eight outstanding mathematicians in three generations.

Similarly, lack of mathematical ability may run in families. In a study of a large family of defectives and delinquents in Pennsylvania, a strain was found in which there seemed to be an inherited lack of the sense of quantity and number. When Aaron Rufer went to work in the morning he had to measure out the meat and potatoes which his wife was to prepare for dinner. If he left it to her, there was no telling how much she would cook. In one line this defect has persisted for five generations; in others, marriage with normal persons has brought an improvement.

2. Direct measurement of the degrees of difference between parent and offspring shows that they behave as if due to heredity, and there is also segregation—not all the members of a family are gifted alike. One of the greatest calculators of recent times was Jacques Inaudi. His brothers became envious of his fame and tried to set up in the same business themselves, but without the slightest success—it was not in them. Jacques was an uneducated boy—he did not even learn to read and write until he was

grown. His methods seem to have been comparable to those of K.

3. It appears at an early age, as in Zerah Colburn's case. Probably most of the mathematical prodigies have not been freaks, but men who later became distinguished in other lines—among them James Watt, one of the inventors of the steam engine; William Herschel, the astronomer; D. F. Arago, the astronomer; P. S. Laplace, the astronomer; Isaac Newton, who had invented the differential calculus before he was 24; A. M. Ampère, the physicist, and men who devoted their lives to mathematics, such as K. F. Gauss, L. Euler, Th. Joung, and George Bidder.

4. It behaves independently in transmission. It may appear with almost any other type of talent; it may be lacking with almost any other type of talent. It is generally believed to be rare in association with literary talent and artistic talent except musical, but commoner with musical talent. A study on this point, however, did not reveal that musically gifted people are any more mathematical than the rest of their relatives. Most commonly, it appears in men and women who possess a high degree of general intelligence; but the examples cited in this chapter show that some forms of it, not depending so much on mathematical reasoning as on memory, may be found in persons of relatively low intelligence.

5. It comes out in spite of discouragement. Several

of the Bernouillis were educated for other careers, but the urge of mathematics was too strong for them, and they gave up their professions in order to devote themselves to their specialty. Karl Pearson has also told graphically how, after he had become a lawyer, the necessity, so to speak, to be a mathematician caused him to break entirely with his surroundings.

6. It is little influenced by training. This has been shown not only by a wide range of special tests in psychological laboratories, but by the actual experiences of school children. In a study of California pupils at 8, 11, and 14 years of age, it was found that arithmetical ability changed less than almost any other ability tested (spelling ability was the most nearly comparable in this respect),[2] and that approximately 97 per cent of the adult differences in this capacity could be ascribed to original nature, which the years of training had modified to the extent of only 3 per cent. Arithmetical computation was also extraordinarily independent of training, spelling again being second.

[2] Spelling ability seems to be as much determined by heredity as is any ordinary mental trait, the correlation between children of the same parents being .50. Little or no relation has been found to exist between spelling ability and various methods of instruction, or school surroundings, or even foreign parentage. Above a given minimum —say, among college students—spelling ability is not closely associated with general intelligence.

III

THE RÔLE OF HEREDITY IN CRIME

Instances where criminal and antisocial qualities run in families are abundant. In addition to many isolated cases there are great tribes composed largely of the anti-social: the Juke family, the Nams, the Zeros, the "kak" branch of the Kallikaks, and the like. Whether the delinquencies of such persons should be ascribed wholly or partly to heredity has been decided almost wholly by the point of view, not the evidence. Some have assumed unhesitatingly that a tendency to steal silverware is at least as strongly inherited as a tendency to compose sonatas. Others, a little more precise, have looked on the born criminal as constituting a breed apart from other men, as a hereditary or congenital degenerate, to be distinguished by certain stigmata. Glancing at a parade passing the reviewing stand, they would pick out all the actual or potential criminals by noting the shape of the skull, the distribution of the hair, the form of the ear, the slant of the shoulder blades, or the angle of the jaw. This school, which had a vogue for some years, is associated particularly with the name of the Italian criminologist Cesare Lombroso.

Still others, and their number has been increasing in late years, have held that society makes the crimi-

nal; that early training and bad companions will inevitably change the minister's son into a jailbird; and as the cart bearing the condemned jolted its way to the gallows they crossed themselves, exclaiming with the old Greek, "There, but for the grace of the high gods, go I."

That criminality as such can not be inherited, goes without saying. It is a social, not a biological, fact. But some kinds of individual might be led to commit criminal acts more easily than are others. An investigation of great numbers of criminals shows at once that most of them are in some way abnormal.

The proportion of the mentally defective depends largely on the type of criminal being investigated. Men in the penitentiaries, most of whom have committed crimes requiring a certain amount of intelligence, on the average are much brighter than the guards who are expected to "reform" them. It needs no argument to show that an imbecile, who can scarcely write his own name, will not be found among the convicted forgers or defaulting cashiers. Setting fire to an old outbuilding is nearer his level. He likes to watch the blaze; to see the hook and ladder come tearing down the street.

Hence it has been found that the distribution of intellect in American penitentiaries is about what it was in the army. The percentage of mental defectives

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may be anywhere from 5 to 20, compared with a percentage of not more than 5 in the population at large.

Lesser offenses bring the dull person into the toils. It is the stupid child who is continually getting into trouble with his teacher, the stupid soldier who is constantly up before his officers for breaches of discipline. When it comes to felonies, college graduates figure in somewhat more than their fair proportion. This is particularly true of crimes of fraud, in which criminal ancestry also plays the smallest part.

The feeble-minded offender will be more likely to appear in the county jail, house of detention, reformatory, or correctional school. Here the mentally deficient are almost never less than 20 per cent, often 30 per cent, 40 per cent, or more, of the total, while persons of superior intelligence are correspondingly rare. Among 470 boys at the Whittier State School of California only 1 per cent had IQ above 110, whereas 20 per cent of ordinary school boys will be found above that line, at the very lowest calculation.

This should not be construed to mean an equal percentage of feeble-mindedness in the routine of a juvenile court. The worst are sent to institutions, the least delinquent and most intelligent are likely to be sent home or paroled. Moreover, in some states the institutions for delinquents are filled up with dependent defectives who ought to go elsewhere, but for whom the state has made no other provision. Prob-

ably the average run of boys and girls passing through an ordinary juvenile court in the course of a year does not contain more than 10 per cent of feeble-minded though many are dull or on the border line. Of the English delinquents studied by Cyril Burt, only 8 per cent had IQ below 70.

Mere lack of intellect, of course, does not make an individual commit a crime. It acts indirectly:

1. The mental defective may not know the difference between right and wrong, either through lack of appreciation of values, inability to profit by experience and remember consequences, or inability to learn the conventional moral code. Such deficiency appears to be rare, however, and the old concept (still retained in English law) of the moral idiot or imbecile, who was normal in other ways but had no understanding of right or wrong, is probably imaginary. It has been applied to all sorts of people; Augusta Leigh, who bore a child to her half-brother Lord Byron, was called by her friends a moral imbecile. In a similar vein a historian speaks of Julia, daughter of the emperor Octavianus Augustus, as having "moral paralysis." The use of these figurative terms in a biological application is likely to cause confusion. In general, defectives who are smart enough to commit a crime are quite smart enough to know that it is a crime. The story of the idiot who cut off a sleeping man's

head in order to enjoy his surprise when he awoke is a good story, but nothing more.

2. Although they know they are doing wrong, they may not have the strength of character to resist evil suggestion, or the foresight to recognize a remote and great good as more worth while than an immediate and small good. This is undoubtedly the basis of the criminality of most mental defectives, and is the more serious because of their lack of resources for the expression of their energy, which makes them take "the easiest way" in surroundings where this way is not advantageous to society. A powerful contributing factor is the maladjustment of the boys or girls in school, where they are often unable to meet the demands made upon them by an educational system unfitted to their needs and capacities. Truancy follows, and may be the first step toward delinquency.

3. Finally, it may be that the stupid are the ones who are caught, while the intelligent, wealthy, or influential criminal keeps out of jail and hence does not get into the statistics. This theory, which contains some truth, is said to be favored strongly by most of the criminals themselves.

In any case it is true that the person with subnormal intelligence is always a potential criminal. If he gets into wrong company or forms wrong habits he will conflict with the law. This is also true of the person with average or even superior intellect, but to a somewhat

less degree, for the latter will probably yield only to stronger influence. On the most conservative basis, the subnormal are several times as likely to get into difficulties with the police, as are persons of average intelligence.

This is not the same as saying that most criminals are intellectually deficient, or that most intellectually deficient persons will become criminals. The great bulk of these are law-abiding, more or less useful members of society, needing merely guidance to make them self-supporting, happy, and productive. So long as students looked only at the career of the criminal before he entered prison, a one-sided view was had, which was corrected when they began also to consider what happened to him after he left prison. There is no room here for a doctrine of predestination, as my own investigation of the careers of sterilized inmates of the Sonoma (California) State Home for the Feeble-minded shows, in agreement with many other such studies.

While none of these young people was intellectually superior, they ranged all the way from idiot to normal. Three-fourths of the girls had been sexually delinquent prior to commitment. Half of the boys had had difficulties with the law-enforcement officers, while half of the remainder had given their parents trouble and probably would have ended as delinquents if they had not been committed to the institution.

When the family histories were divided into two groups, positive and negative, according as there was or was not any other instance of mental deficiency or disease reported, I found no correlation whatever between the amount of delinquency and the family history. Those from the sound families were just as likely to have been most troublesome as those from the unsound. Of course this classification tells little or nothing about the real home atmosphere—it is intended merely to show that the presence of mental defectiveness in a family is not the whole story. There was a correlation, however, between the IQ and the amount of delinquency, amounting in the case of the boys to .33 and of the girls to .21. It was positive in both instances—in other words, the more intelligent the boy or girl, the more likely to have been delinquent before admission.

This conclusion would not be true of the whole population. The subjects of this study are a highly selected lot. The most deficient among them are probably most carefully supervised at home; then, too, it takes some brains to get into trouble. Finally, there is doubtless a selection in the commitments—a delinquent boy or girl is sent to Sonoma when a non-delinquent brother or sister of the same level of intelligence would be left at home.

It has frequently been asserted that the girl who tends to become delinquent is the girl who matures

early and is sexually precocious. It would be easy to err on this point by dealing with a population made of several races, one of which matures early and also furnishes a large amount of delinquency. No such tendency was found in the Sonoma girls; there was no correlation whatever between age of onset of menstruation and degree of sexual delinquency prior to commitment.

Just as interesting as the career of the boy or girl before commitment to the institution was the career on parole after leaving it. There was little or no correlation between success and either the type of family history or the IQ.

The average time spent on parole by these subjects was twenty months, and 40 per cent of them had been out for less than a year, hence there is plenty of time for some of them to fail yet. The only check on this is to correlate success on parole with length of time spent out of the institution; the coefficients for both sexes were 0, showing that there is no discernible tendency for the percentage of failures to increase as time goes on. The only factor found to be associated significantly with success on parole was the previous record of delinquency. Those who had not been in trouble prior to commitment are several times as likely to succeed on parole, as are those who come to Sonoma with a record of delinquency behind them.

These facts point strongly, it seems to me, to the

true place of intellect in the problem of criminality. It is a secondary one—that is to say, society can make it a secondary one if it handles the problem in an intelligent way. It is not the individual with a mere low IQ who makes the acquaintance of the courts; it is the maladjusted individual with the low IQ; it is society's business to see that individuals with low IQ's are put in such positions and given such assistance and supervision as to avoid maladjustment. The real trouble is due to factors of the personality than can not be measured with the facile finality of the IQ.

More important in the ranks of the criminal and anti-social are the individuals who are not mentally defective but mentally diseased. Their ancestry is marked in much higher degree than usual, with alcoholism, epilepsy, insanity, and nervous disorders of all kinds; they themselves present much the same picture. Sometimes sleeping sickness results in extraordinary changes of conduct. Of the boys at the Whittier State School, 42 per cent were described as "extremely nervous," as compared with about 10 per cent in the schools of various cities. The data at Sonoma State Home were not studied from this point of view, but the perusal of the case histories leaves the impression that conditions are about the same there, as they have been found to be in other studies both in America and England.

The high percentage of broken homes in the back-

ground of juvenile delinquency, points in the same direction. It is rare to find a study in which less than 50 per cent of the delinquents come from broken homes, and the percentage is more frequently 70, 80 or 90. The percentage of non-delinquents in the same social strata, who come from broken homes, is not one-fourth as great.

This frequency of broken homes points again to the instability of the family stock, which was indicated by other figures. In 823 cases studied by William Healy, defects (mental, glandular, or temperamental) were found in 61 per cent of the families— mostly in the parental generation. Alcoholism existed in more than half these families. It is such families as this that would be expected to produce marital infelicity and to provide bad discipline for their children as well as to bequeath to them unstable nervous systems; and they do not disappoint the expectation.

It has been guessed that 75 per cent of the crimes in America are committed by men who are either unmarried or separated from their wives. Criminality is not often associated with a normal family life. Starting with bad material, bad childhood training and bad associates complete the picture. But these would not so easily produce criminals, if the material on which they work were not bad.

Moreover, as is usually the case, the individual who is mentally peculiar tends to be physically peculiar.

He is an abnormal individual in every way, an inferior who does not fit into society; and he is such primarily because of his heredity, secondarily because of the inefficient way in which this heredity is dealt with by parents, teachers and associates.

It is easy to attribute too much importance to a knowledge of right and wrong. The criminal has nearly always had a chance to know better. Commonly, he is a pious person,—indeed intenseness of religious convictions and professions is one of the peculiarities of the class.

From numerous interesting illustrations, I select but one. A list of sixteen "bad" practices has been given to thousands of university women, who have ranked these in the order of badness. The same list was given to 138 female delinquents, nearly all of them sex offenders, who were also asked to rank them. Table I shows the results.

The agreement in order of ratings, by these two different groups of women, is remarkable. On the whole, the delinquents tend to be a little more conservative, the collegians a little more liberal, as judged by the rating of such things as smoking and Sabbath breaking. The principal difference relates to cheating, with the evils of which college women are by training more familiar, and hence rate it a more serious offense.

The general conclusion is that a group of female

delinquents, whose troubles have been sufficiently serious to land them in the reformatory, has just as much of what might be called normal moral insight as has a group of university women. Its difficulties with

TABLE I

RATINGS OF CERTAIN PRACTICES BY TWO GROUPS OF WOMEN

PRACTICES	ORDER OF BADNESS	
	University women	Reformatory women
Sex irregularity	1	1
Stealing	2	2
Cheating	3	9
Lying	4	3
Drinking	5	4
Gambling	6	8
Vulgar talk	7	6
Sabbath breaking	8	5
Swearing	9	7
Gossip	10	11
Selfishness	11	14
Idleness	12	13
Snobbishness	13	15
Extravagance	14	12
Smoking	15	10
Dancing	16	16

society, then, are not due to any lack of understanding of what society expects.

While one can not make sweeping statements that apply in a field like this, in which every criminal is a

unique individual, I believe it is safe to say that in a majority of cases the criminal either lacks intelligence to manage his own affairs with ordinary prudence and success, or more frequently has a mind so twisted, warped, or poisoned that it is not easy for him to adapt himself to the requirements of normal social life, which continually demands certain amounts of unselfishness, self-negation, self-control—indispensable bases of all civilization. Put into another environment, he may get along admirably. As an extreme illustration, there were 1,100 known habitual criminals in the English army in 1915, and at least one wore the Victoria Cross. Other armies probably had fully as large a proportion of men who at home in time of peace had failed miserably to adapt themselves to the inexorable requirements of civilized living. In 1928 the warden of Sing Sing stated that 20 per cent of his charges had service records, although a large part were excluded by youth.

There remains a minority of more intelligent criminals, who are such from cold-blooded calculation. Crimes of gain, rather than crimes of passion, characterize them. They deliberately adopt a career of crime on the ground that it is the most profitable and interesting open to them. They form a large part of the old offenders: as rapidly as they are released by a too-lenient parole system, they hasten to return to their profession, profiting by their past mistakes and

by the tips they have picked up from fellow-citizens of the penitentiary. Probably in their case, too, there is present a certain inherited instability, a lack of inhibitions that characterize the normal animal; yet it appears that faulty education is much more to blame for the careers of this minority, than for the majority before mentioned.

Public reluctance to admit that criminals like saints are made, not born, seems to be due mainly to a feeling that the admission will do away with punishment. A few writers have taken this attitude. The unfortunate convict could not help it; he "never had a chance;" his parents might be reprobated but he should only be commiserated.

This is not logical. If a man commits crimes because of faulty mental hygiene, it may be that the best way to protect society and improve mental hygiene is to have him boiled in oil, or dragged by wild horses, or scratched out with sharpened fingernails, only one to a customer, like the hero of *Salammbo*. That is a practical question which does not enter into the scope of this paper; it is to be decided by experiment or by the experience of the past.

To drop the predestinarian view that a criminal is born such and is a helpless victim of his inheritance by no means necessitates a sentimental, laissez-faire attitude toward the offender. The people of Tennessee probably do not differ much in "hereditary criminal-

ity" from those of Scotland; yet in proportion to population and number of fellow-citizens assassinated in the course of a year, a Memphis undertaker can send out thirty-five bills for funeral, complete, as per attached statement, to every one that he could indite if he stabled his hearse in Edinburgh. It is at least conceivable that the difference may be partly due to the rigor with which criminals are treated by John Bull, and that Uncle Sam might improve the mental hygiene of his criminal classes by borrowing some of the features of British crime prevention, crime detection, and law enforcement.

The direct resemblance between parent and offspring in respect of crime is not great. An English study of 1,500 convicts showed that 25 per cent of convicts could be expected to produce at least one child each who would at some time be convicted of crime. On the other hand Cyril Burt, after surveying his own and other data, concluded that "the number of criminal children who might be said to have criminal blood in their veins is, after all, comparatively trifling;" and in a study of 300 families, each of which had contributed a delinquent boy to an institution in California, information was got about 3,971 relatives of whom only twenty-three were known criminals and only one of these was a parent. This is a low figure, and many of the adults still had time to fall into the hands of the police. It was calculated that 7.2 per

cent of the male population of England and Wales will be convicted of crime before death. The inheritance of professional criminals greatly needs study. It may be quite different from that of juvenile delinquents. At present one must be cautious in applying the facts of one group to the other.

Of inherited traits that have a bearing on criminality, nomadism is particularly interesting. Man is, by inherited nature, probably nomadic or migratory just as the birds are. The anthropoid apes, his closest relatives, show a wandering tendency; many if not most primitive peoples are migratory; the blind impulse to run away is extraordinarily frequent among young children, from three to six, as many parents know to their sorrow, and it has a still stronger outbreak at the time of adolescence, when the emotions in general are intensified by an increased activity of the internal glands.

Nomadism as an impulsive, unreasonable, habitual form of behavior is normally inhibited, probably by a definite genetic influence, immensely reinforced by all the pressure of civilization. That this inhibition is connected with the sexual constitution is indicated by the fact that nomadism is so much more common in men than in women. (As a parallel, it will be recalled that migration in birds seems to be governed largely by changes in the secretions of the ductless glands.) In some races, nomadism has probably been

largely bred out by the migration or death of the least-inhibited. On the other hand, a nation like the United States which is peopled by immigrants, that is, those in whom the home tie, the tendency to "stay put," was not strong enough to prevent them leaving everything with which early life had been associated—such a nation would be expected to show a large proportion of nomads; and it does. "The American," James Russell Lowell complained, "is nomadic in religion, in ideas, in morals, and leaves his faith and opinions with as much indifference as the house in which he lives." The development of cheap automobiles and auto camps has enabled the expression of this impulse to a striking degree during the present generation, as in other countries and ages the sea formed the easiest outlet. Sinbad the Sailor is the perfect illustration of the born sea-nomad.

The strong family tendency was shown in a California study of delinquent boys. A group of twenty-four was selected which had been markedly nomadic, and 312 of its relatives studied; 30 per cent of them were found to be nomadic. A like group of twenty-four boys who had showed no nomadic tendencies was investigated in the same way: of its 318 relatives only 1 per cent was nomadic.

The most familiar example of nomadism is furnished by the gypsies, descendants of tribes who left Northern India 1,000 to 1,500 years go and have gradually

worked westward. There has been incessant in-breeding in this group, and also continuous and stringent selection, so that nomadism ought to be thoroughly dispersed among them in an intense form at the present time; and apparently it is. Their children are reputed to be strong and healthy, and although they have little schooling, the customary mental tests in England disclosed that they are definitely bright. So far as is known, there is no relation between nomadism and intelligence. Certainly there is no evidence that it is an accompaniment of low intelligence, although a deficient person may have less reason for suppressing his nomadic inclinations.

Since the tendency to deception underlies much bad behavior, it is interesting to find, among 734 pairs of brothers or sisters, that children of the same family resemble each other in deceptiveness just about as much as they do in intellect. The home background of these children was studied and the amount of deceptiveness shown to be about as independent of the range of home background as is the IQ. The conclusion was reinforced by finding that pairs of orphans showed almost as great resemblance as pairs of children living with their parents. While one would at first thought probably be inclined to assert that deceptiveness is the product of bad training, it may be more truthful to say that the trait is inborn (since lower animals show it), and that lack of deceptiveness

is the product of good training. Further study will be necessary to show how far such traits as this have a specific biological basis, and how far their expression is capable of modification by training.

Honesty was further found to go with emotional stability (which is largely inherited), while deceit was associated with a background of parental discord and bad example. At first sight this suggests "contagion," yet the parents' dishonesty may have been on a bad biological background also. The relation of biological factors to broken homes offers an interesting and almost untouched field for study. The fact that divorces are three times as common among the mentally diseased as in the whole population points to the importance of the constitution. No correlation existed between honesty and physical health.

Honesty was found to be greater, the higher one ascended in socio-economic levels and in the IQ scale (to a large extent these two are the same thing). Judy O'Grady tells more black, if not white, lies than does Lady Clara Vere de Vere. The belief of many men that dishonesty is a womanly attribute was not borne out by this study: no sex difference was found.

On the other hand, the gifted children of California, who were far beyond their age in traits of character and personality—the nine-year old of this group having a character as well developed as that of the ordinary fourteen year old child—showed a distinct sex

difference. In almost every respect the girls surpassed the boys, because (among other reasons) of their greater maturity at the same chronological age; but in tests for honesty boys, in both the gifted and the control groups, surpassed the girls significantly.

It is held as an article of faith, in some social circles, that every gentleman will lie for certain purposes. Napoleon was a notorious liar but presumably did not display this gift on the proper occasions, or the Duke of Wellington would not have been led to his final summing-up of his opponent: "The fellow was no gentleman." But when a gentleman, or a lady either, lies without any purpose at all except enjoyment, the supposed virtue becomes a disease. Most of these "pathological liars" who have been studied are female. Nearly all showed a background of bad heredity, but of course the habit could not be inherited as such.

The trait is not sex-limited, at least, for the male sex can furnish some good illustrations; none better than the French novelist Henri Beyle, alias Stendahl, who is a perfect specimen of the pathological liar. One can not believe a word he says, although it is a fair assumption that his statements "go by opposites" as dreams are said to do, and as the statements of Count Ignatieff, former Russian ambassador at Constantinople, were known to do. (But this was diplomacy. Prince Bismarck, it will be recalled, said that

he never gave credence to a rumor until it had been denied officially.)

When M. Stendahl declares, in the preface to *La Chartreuse de Parme*, that the book was written in 1830, and 1,200 miles from Paris, one may be sure that it was written in the heart of the metropolis in 1839. He once said in a letter, "I should like to wear a mask and change my name." He did so. Biographers have picked out more than 200 instances in which he is known to have falsified as to date or place of his letters; and all the rest are under suspicion. The man lied merely for the pleasure of lying, and when charged with it replied smilingly, "Quite so." He could not even R.I.P. under the truth but had to perpetuate a lie on his tombstone, where he is described by his own wish as "Arrigio Beyle, Milanese," instead of "Henri Beyle de Grenoble."

Suicide has sometimes been called an inherited trait, partly on the history of "suicide families" in which, for several generations, self-destruction occurs at the same age and in the same way. I take a recent illustration, though not one of the most extraordinary, from a newspaper clipping: "Oscar Badger, seventy, hanged himself on the thirty-fifth anniversary of the death of his father, and from the same beam in the same barn where his father hanged himself. His mother also hanged herself at their home several years ago."

The suicidal trend is of greater significance because

it is so often accompanied by homicide: so that a newspaper may keep the headline, SLAYS WIFE AND SELF, standing in type for daily use.

Properly speaking, suicide can no more be inherited than can criminality; it is a misuse of words. It is doubtful if there is even an inheritance of suicidal tendency. But there may be the inheritance of a mental disease, as a result of which the patient is depressed, and such that his suggestibility and lack of inhibitions lead to death. The similarity of details is due to imitation.

The causes leading to suicide were classified, in one series, in the following order: mental disease, alcoholism, severe grief, incurable disease, and poverty.

These causes are strongly related to each other; there is a biological foundation for all of them; hence the indirect importance of heredity is plain enough. It is worth mentioning, in passing, that autopsies on four series of female suicides showed 28 per cent, 33 per cent, 36 per cent, and 56 per cent took their lives just before or during menstruation, when there is a regular depression of vitality among women. In a random group of women, 18 per cent will be found to be menstruating at any one time. Differences in the intensity of this disturbance are inherited.

Here as everywhere, conduct is the final product of innumerable factors, large and small, direct and indirect. Only the most penetrating individual and

community case studies can reveal the actual causes of criminal behavior; but statistical methods can show something of the background and reveal the trends. Just what a man does, in any given situation, is determined by many outside factors, partly accidental. But the general nature of his reactions, whether violent or repressed, and often the question whether he does anything at all, is settled largely by the nature of his inherited temperament.

In short, those who say crime is not due to heredity are just as wrong as those who say it is.

Society can reduce the amount of criminality to almost any degree it desires, by bringing up its youth properly. But some will, under the most favorable circumstances, be found much harder to bring up properly than others, because of their inborn natures. A few may be "brought up properly" only if they are kept in life-long segregation in a colony where the environment will not put too great a strain on their endowments; and some parents will be recognized as so incompetent to bring up children properly that they may be denied parenthood altogether. In any case it is agreed, I believe, by almost everyone who knows anything about it, that the problem of adult behavior is usually settled one way or the other in childhood.

The child of good ancestry who is the product of a broken home (as most juvenile delinquents are); who learns from his own parents the lessons of irresponsi-

bility, of selfishness, of indifference to the welfare of others, of disregard for the obligations to society; who goes through the public schools, in which little effective effort is made to inculcate the most important traits of character; and who is turned loose to shift for himself among delinquent associates—this child may well become a criminal.

The child of bad ancestry, unstable, lacking in the biological foundations of self-control, who goes through the same course, may well become a criminal also. And children of bad ancestry are more likely to go through such a course, than are children of good ancestry.

IV

YOUR CHILDREN'S CHANCE TO BE TALENTED

That musical capacity is inborn is widely believed and seems to be supported by the evidence.

Johann Sebastian Bach was passionately devoted to music by the age of ten, and is supposed to have composed several fugues before fifteen, although his first extant work does not date much earlier than eighteen.

Ludwig van Beethoven's "one interest from his earliest youth seems to have been music." He gave his first public concert at seven; his first composition was written at ten. Some of the compositions of his thirteenth year have been published.

Georges Bizet entered the Conservatory of Paris at nine.

Johannes Brahms devoted so much of his time to original composition between his tenth and twelfth years that his piano teacher began to complain. He said that he had invented a system of musical notation for his own use before he was old enough to know that such a thing already existed.

Franz Chopin is said to have produced pieces for the piano as early as eight; at the age of 20, when most

boys are in the rah-rah stage, he was already a perfectly matured musician.

Claude-Achille Debussy entered the Conservatory at eleven.

César Franck appeared as a virtuoso at eleven.

Charles Gounod, who declared that he drank as much music as milk from his mother's breast, said he had a clear and precise idea of the difference between the major and minor modes before he was old enough to talk plainly.

Christopher Willibald Gluck, brought up in the woods by his father, who was a sort of forest ranger, knew nothing of music until he went to school at twelve. It immediately took hold of him, until at eighteen he had resolved that "a musician he would be and nothing else."

George Frederick Handel was destined by his father to be a lawyer, and all his early musical interests were discouraged violently. Nevertheless, "his earliest delight was a mimic orchestra," he was composing good trios at ten, and had turned out a successful opera at twenty.

Franz Josef Haydn showed marked musical talent while still in the kindergarten period, and was beginning to compose at six. From eight to eighteen he worked mostly on music while the other boys were at their games, and by twenty-four he was a fully recognized genius.

Josef Hoffman was, in 1883, concert pianist and composer at the age of seven.

Jakob Ludwig Felix Mendelssohn-Bartholdy, one of the ideal child prodigies of history, played the piano with extraordinary ability even in his eighth year, and in his eleventh and twelfth years wrote 50 or 60 complete movements. His sister Fanny was quite his equal as a performer, though she did not display the same creative talent.[1]

Yehudi Menuhin is said to have shown "musical consciousness" at twelve months, when he first attended a symphony. After he began to take lessons, at four years and ten months, "every lesson was a month's progress." He had ten concertos at his command when he appeared as a soloist with the New York Symphony Orchestra at the age of ten, and when W. J. Henderson wrote that he "played in a manner disclosing prodigious command of the violin and a genuinely musical temperament."

Giacomo Meyerbeer, a famous pianist at nine, was composing before the age of ten.

Wolfgang Amadeus Mozart found his sole absorbing

[1] The lack of creative talent among women stands out nowhere more prominently than in the arts, which have in most ages been their special domain. For every man who has studied music or painting during the last thousand years, probably a dozen women have studied it, yet there is in none of the arts (with the exception of the histrionic art) a woman who will rank among the first 10 or 15 men. Even the great cooks and dressmakers have been men.

interest from childhood in music. His first pieces are said to have been composed at five, when they were written down by his father. Two years later appeared his first published work, four sonatas. "A series of minuets, dating from his sixth year, are distinguished by the formal purity of their style, simplicity, and clearness of melody." In the year 1764, when he was eight, he had already produced six sonatas for the piano and violin and three symphonies for small orchestra. At twelve his first operetta was performed.

Erwin Nyiregyhazi, whose early development has been studied more fully than that of any other child prodigy in the history of music, was not one year old when he tried to imitate singing. In his second year he was able correctly to reproduce melodies sung to him, when he was still unable to talk plainly. (Handel also sang before he could speak.) At the end of his third year it was found that he had the gift of absolute pitch, which neither of his parents possessed, though they were both musicians. At this period he reproduced exactly, on the mouth-organ, any tune he heard; within a few months he transferred this ability to the piano, and at three and one-half years was composing original melodies with accompaniment. He played his own compositions in public in his fifth year; up to that time he had received no lessons in music, but had picked up everything for himself. In his sixth year he began to turn out his first written pieces

such as a barcarole, a berceuse, a dance of elves, a wedding march, a funeral march for 'cello, and a serenata.

Gioachino Antonio Rossini played and sang in public by the age of twelve and was directing at fifteen. His first opera was produced when he was eighteen.

Camille Saint-Saens named the notes at 30 months, and a few months later finished in 60 days a standard piano course. At ten he gave his first public concert.

Franz Schubert is said to have written quite a number of songs and pieces for the piano before his tenth year. His rapid advance as a composer and his enormous productivity are matched only by Mendelssohn. In his eighteenth year (1815) he composed a number of works for the stage, masses, sonatas for the piano and about 170 songs.

Alexander Scriabin extemporized on the piano at five, although he did not write any compositions until eight. A single hearing of a piece at a concert was sufficient to enable him to sit down at his own piano and reproduce it exactly.

Richard Strauss commenced composing at the age of six.

Karl Maria von Weber found his only absorbing interest in music from early childhood, published his first composition at eleven, and wrote the music for a successful opera at thirteen. He has the distinction of furnishing the air ("America") which four countries

—Germany, Austria, England, and the United States —have adopted for a national song.

Efrem Zimbalist was first violin and soloist in an orchestra at eight.

Any music lover can extend the list indefinitely from his own knowledge. The brief summary I have given, including almost every type of musical talent, is sufficient to show that the popular belief is well founded. Musicians, even more than poets, are born, not made.

No other form of special talent in the entire range of human achievement can show such a record of early appearance of genius as does music, although general intelligence is perhaps a little earlier. The future painter, poet, or sculptor has some need for seeing, for reflecting, for understanding the world of nature before he can show himself to be a supreme artist. The musician has everything in himself. He has no need for prolonged study of the world outside; he merely calls on his own inner resources, and up to a certain point these suffice him.

Looking at the matter a little differently, one must recognize that music is essentially a primitive art.

Indisputably, the greatest attainment in creative music is impossible to one lacking intelligence; yet many savages have a great deal of musical feeling, and could probably be educated to perform modern

music acceptably. The musicality of the Negro race is appreciated fully in America.

The inborn capacity of the cave man for music was possibly as great as that of modern man; for this capacity depends upon the ear, in the first place, and there is no evidence that the fineness of the sense has increased during the historic period. Nor has modern man any more intelligence than, say, the Athenians, who possessed no harmony and admired choral singing in octaves which nowadays would not be thought worthy of the kindergarten. The emotional equipment of modern music lovers is apparently not superior to that of the Arabs, whose literature records many instances of persons who fainted, or even died, on hearing a song. Clearly, the modern musician with an orchestra at his command achieves more than does the painted cannibal with his tom-tom, because he has the advantage of the development of the art through many generations, and of tradition which allows him to profit by the gains of the past.

In other words, musical expression and musical appreciation are a normal part of the human race. This does not mean that capacities in either respect are equal, but it does mean that the average would be much higher than at present, if education were conducted differently. Proper education probably would not increase materially the number of Bachs, Mozarts, and Haydns, but it would increase immensely the

number of those capable of understanding and enjoying the works of such masters.

If the fundamentals of musical talent are primitive accomplishments, what is it that makes a great musician? Some light is thrown on this question by a study of the traits of eleven musical geniuses in comparison with some 300 men eminent in other walks of life.

The musical geniuses (Bach, Beethoven, Gluck, Handel, Haydn, Mendelssohn, Mozart, Palestrina, Rossini, Wagner, and Weber) in this particular study show a high average intelligence (IQ at least 160), but they rate somewhat lower than do other great men on intellectual activity, the intellectual-social traits, and physical activity, and relatively higher on the intellectual-emotional traits. The directions in which they particularly excel other great men are esthetic feeling, the desire to excel, belief in their own powers, originality of ideas, extent of mental work bestowed upon pleasures, working toward a distant goal, persistence in the face of obstacles, quiet determination, and a tendency to rate their own abilities correctly.

The possession of these qualities, together with the necessary fundamental capacities, will not automatically produce a musical genius; but it is difficult for a man or woman to become a musical genius without possessing most of them.

A study of the geniuses in the list I have given at the

beginning of this chapter, and still more a study of the more ordinary manifestations of musical talent, show clearly that, in general, ability in performance appears earlier than creative ability. This is to be expected. There are, indeed, thousands of competent performers for every one who shows really original creative power.

The facts that music runs in families and that great musicians are concentrated in related groups suggest the importance of heredity but do not prove it, for the same result might occur if musicality were due to training.

More careful studies of family histories show that the results of various types of mating are about what would be expected if musicality is indeed inherited.

Such evidence strengthens the case, but still does not make it perfect, for the primary question, whether a given individual in the ancestry is or is not "musical," depends merely on someone's opinion, and no two persons, giving information on this point, will have the same standards of judgment.

Abe Martin observes (and I have been able to verify the statement in my own household) that in every large family there is always one child young enough to enjoy his father's singing. Is this child to be considered the most musical one of the family? If not, just what does "musical" mean?

"Musicality, primarily, denotes the ability to enjoy music esthetically," says one writer. "Further, every

degree of profound understanding of musical form and the structure of musical composition is based on musicality. A musical person has a fine and developed instinct for the style and the rigid order of a musical sequence of ideas. Another necessary characteristic of a musical person is his capacity for becoming absorbed in the emotions expressed by music and his ability to enter into so intimate a relation with it, that the whole organization of his soul is affected. The possession of all these qualities results in a capacity for enjoyment which makes music part of the listener's very life, and gives him the power to judge and appreciate musical works of art according to their true value."

Very good; but very difficult to apply in a study of inheritance. For practical purposes it is necessary to break up this "fundamental entity" into more convenient parts. This has been done with notable success by C. E. Seashore and his own studies of the various elementary traits, together with similar studies by his students and others, bear out the expectations.

Pitch may be taken as an illustration. There are about 35 d. v. (double vibrations per second) between one note and the next—say A$^{\#}$ and B—of the standard scale.

Pupils who have a sufficiently fine ear to recognize a difference of two vibrations or less are capable, in this respect, of becoming good musicians. Those

whose discrimination lies between three and eight vibrations (and this includes the great majority of people) have a sufficiently accurate discrimination for the customary musical instruction and enjoyment, but such a one is not likely to become a great violinist, although a famous American singer was found to have a pitch discrimination of only 6 d. v. Pupils whose score lies between 9 and 17 vibrations should not be given any musical instruction unless they particularly desire it, and they might well be excused from class singing in the schools. The child whose discrimination is 18 or above should probably not be encouraged to have anything to do with music, for it would be time wasted. He is tone-deaf.

Ludwig van Beethoven, it is true, was physically deaf in adult life: but he was not born that way.[2]

Determination of pitch, that is, the ability to name a given note when it is sounded, is of course a different

[2] From the psychoanalytic side, it is urged that musicality may be a compensation for some kind of inferiority, and Alfred Adler points out, specifically, that L. van Beethoven and W. A. Mozart both had deformed outer ears. The inference is that, feeling themselves inferior for this reason, they worked with great assiduity to show their superiority in something else, namely, music. Assuming for the sake of argument that explanation is valid, it does not dispose of heredity. If a man, for any reason, works with great assiduity and success on his music, the underlying reason may be that he had particular talents along that line. Otherwise he might just as well have worked at something else. Hence the psychoanalytic explanation, far from conflicting with the inheritance of talent, really supports it.

thing from discrimination. It is a good parlor trick. In many cases it appears that the note is identified by its timbre quite as much as by its pitch. Memory for pitch is still another thing—W. A. Mozart possessed it to an unusual degree. He once remarked, when he began to play his own violin, that it was tuned one-half of a quarter tone higher than the instrument he had played two days before.

And so one might continue to analyze "musicality" through all the characteristics of the sound wave.

Those who do not care for scientific accuracy may find the ability to carry harmony ("sing a part"), still more the ability to improvise harmony, a good practical test of musicality. It has been shown to be not at all associated with ability to perform on the mouth organ or Jews' harp! It is also very little associated with a sense of or feeling for rhythm. This last feeling is a fundamental one, and the reason for its relative lack in some persons—whether due to birth or to education—is still uncertain. The fundamental rhythm is a two-point one, supposed to be based on the fact that the two sides of the body are alike; multiples of it, as four and six, are fairly common. A three-point (waltz) rhythm is also common enough, but its origin a little difficult to explain on the same basis. Five and seven-point rhythms are virtually unknown to man; the starfish might be expected to possess the former, if it depends on the arrangement of the body.

With sufficient effort, however, it appears that most persons can be trained to feel a five or a seven-point rhythm.

While much work remains to be done on the inheritance of musical capacity, the general situation is clear. Musicality must be regarded as inborn, and in general it is inborn because it existed in the ancestry. There is little encouragement for an attempt to make a child musical if his ancestry was not musical, or at least, if the ancestry did not have the necessary capacity which would have made it musical in proper surroundings. Whether a child is or is not qualified to profit by musical instruction can be determined easily enough by standard tests. As these tests, given to all the children in many schools, have disclosed the fact that the untalented are now being given musical education in quite as large proportion as the talented, it is evident that there is a great waste of energy, time, and money. A due regard for the facts of heredity will put a stop to this—will release from the piano stool thousands of children who are now drudging away at their forearm and finger movements without the slightest prospect of ever being able to convert them into anything more than forearm and finger movements; and will at the same time discover plenty of undeveloped talent, from which may be made real musicians.

One of Ben Trovato's stories relates to Anthony

Van Dyck who, while a school boy, was concerned that a chum was to be flogged. Anthony at once painted the portrait of the master on the seat of his comrade's breeches. The teacher, preparing for action, suddenly realized the undesirability of laying the switch on his own countenance, and the boy escaped punishment.

The jest at least calls attention to the precocity of artists, and Van Dyck himself was unquestionably painting portraits by the age of fourteen, for one of that period is extant. At sixteen he was maintaining himself independently, and with a degree of recognized success, as was Bartolomé Murillo. Antonio Canova produced two of his great figures, Orpheus and Eurydice, at sixteen. Raphael Sanzio, descendant of eight generations of painters, was helping his father with frescoes at ten or eleven, was executing commissions at seventeen, produced his first famous work, "The Marriage of the Virgin," at twenty-one, and had turned out many of his great masterpieces when he became architect of St. Peter's at 31. Michaelangelo Buonarroti was receiving a regular salary at thirteen for his handiwork. And so the list might be extended indefinitely, as is the case with musicians, down to the child Giotto di Bondone, surprised at his drawing by Giovanni Cimabue, who became his teacher, according to the legend. The early development of talent

for the pictorial arts points strongly to the fact that it depends largely on inborn qualities.

This does not minify the necessity for a cultural background for high achievement, nor does it imply that strength of mental imagery, concept of spatial relations, motor coördination with visual impressions, color sense, and the like spring full-grown like Venus from the waves. Prior to the age of ten, for instance, it is only a rare child that shows any conception of three dimensions. But if the rudiments are there, they will grow under normal conditions.

That artistic capacity is not merely a phase of general intelligence was illustrated strikingly when California was being canvassed to find 1,000 extraordinarily bright children for study. In Los Angeles a special class is established for 50 particularly promising pupils in art, who are given individual instruction twice a week by the best teachers the public schools can furnish. This class was naturally scrutinized to find pupils with high IQ, and the supervisors named six boys and nine girls whom they considered most promising, but intelligence tests showed them to have an average of only 109, the highest being 133 and one as low as 79 IQ. Whatever their promise in art, then, which led them to be singled out, after prolonged observation, from a school population of more than 200,000 children, they were in respect of abstract intellect a quite mediocre group.

Essentials of visual art are that the child should possess in a greater degree than ordinary a knowledge of color, of dark and light, of line, of perspective, of subject matter, and of practical application. If the morons, who lack the patience to complete the tests, and sometimes do not even understand the directions, are eliminated, there is found to be a correlation of only about .15 between these capacities and general intelligence. The highest correlation, .20, is with the discrimination of color, which is really a physiological capacity that one might not expect to be correlated with intellect at all. Similarly art appreciation, although depending largely on education, or rather on the opportunity to acquire good taste, is correlated to the extent of only about .25 with general intelligence, among college students. And the tests of originality and imagination now in use, though by no means perfect, show little or no correlation with the abstract intellectual capacities.

In short, the talents which make a visual artist are innate and, above a minimum level, not much related to the talents which make a child the pride of his pedagogues. The extent to which they are inherited as well as inborn remains to be determined. The fact that artistry runs in families is susceptible of several interpretations. But as not only ordinary vision but color vision is definitely governed by inheritance, it is probable that many other capacities requi-

site in an artist are likewise determined by his genes; and on the other hand that some of them, as in the case of the musician, are by-products of the fine adjustments of growth, hence not inheritable.

Recently developed tests make it possible to predict with a good deal of confidence whether a child has any talent for drawing. Evidently, most of this talent has been going to waste in the past, while thousands of children with no real capacity were dragged through art lessons, just as through music lessons, because their parents had the necessary money and ambition. With more careful study of children, much real talent will be found in unexpected places. The encouragement of such talent will not necessarily produce a great artist, for, in addition to the fundamentals such an artist has other characteristics that are not common: he is marked by a high degree of esthetic feeling and a desire to excel; by originality, belief in his own powers, and a willingness to work persistently with a distant end in view.

The autobiography of Isadora Duncan is a valuable document for the study of emotional expression in childhood, and the combination of circumstances that made her a dancer stands out boldly: inherited sensitivity of the feelings, intelligence, and lack of inhibitions on the one hand; on the other hand an infancy passed in a world of music, and a strong drive for self-expression in the thing which she could do best, to

compensate for the feeling that her home life was a failure.

Acting ability usually develops early (compare the infantile film stars); indeed, any normal child shows, at the age of two or three, dramatic tendencies that seem later to be repressed, and it is an easy assumption that histrionic superiority in later life is favored by the absence of those inhibitions to which the average child inevitably succumbs. Anyone who has seen a show put on by the inmates of an institution for mental defectives will recognize the facts. The desire of many intellectually subnormal children (and adults) to "get into the limelight" is almost diagnostic; and some members of the theatrical profession have been suspected of the same ambition.

While there have been actors of high intelligence, it is generally supposed that intellect is not only a superfluity, but may even be a handicap. A professional concert pianist became premier of Poland, but there is no record of a professional actor holding such a position. A few men who afterward became eminent have shown exceptional histrionic gifts in youth: Cardinal Mazarin was distinguished in this respect, and Alfred E. Smith is said to have owed some of his popularity as a young man to his talent in amateur theatricals. A few eminent men have even displayed the same ability in adult life, particularly men belonging to the more extraverted Latin

peoples; most of those who come to mind were not great men, but merely brilliant scoundrels, like Napoleon Bonaparte. Among English statesmen who "acted" in their official capacities the Earl of Chatham is conspicuous. The most consummate actor who ever achieved prominence in American public life was doubtless Patrick Henry, but he confined his theatricals to speeches, where their effect was successful—never more so, according to contemporary accounts, than in the speech for which he is alone remembered by a large part of posterity, that ending "Give me liberty or give me death!" In public life off the rostrum he was a model of dignity and restraint.

Psychoanalysts say that acting disintegrates the personality; but is it not often disintegrated at the start? For one reason or another, men of outstanding intellectual ability drop acting quickly, if they dabbled in it during youth. Ben Jonson pulled on his learned sock and stepped out of the profession as fast as he could, leaving Will Shakespear to act in his plays; even Shakespear, after his youthful experience, contented himself with the rôle of the ghost in *Hamlet*, not aspiring to portray the introverted Dane himself. And while many people consider him a great dramatist, few lists would rank him among the great actors of the world; nor did he himself have any great respect for most of the members of his profession, he would as

lief the town crier spoke his lines. On the other hand, Charles Dickens' insight made the poor, half-starved moron Smike, the protege of Nicholas Nickleby, at once recognized by a producer as a drawing card.

" 'Why, as he is now,' said the manager, striking his knee emphatically; 'without a pad on his body, and hardly a touch of paint on his face, he'd make such an actor for the starved business as was never seen in this country. Only let him be tolerably well up in the Apothecary in *Romeo and Juliet*, with the slightest possible dab of red on the tip of his nose, and he'd be certain of three rounds the moment he put his head out of the practicable door in the front grooves O. P.' "

And sure enough, the experiment being made, "Smike was pronounced unanimously, alike by audience and actors, the very prince and prodigy of Apothecaries."

Currency has been given to the fact that some of the show girls of the New York Follies passed remarkably high intelligence tests, ranging up to 180 IQ: but not even the most optimistic press agent ever claimed that these pulchritudinous females are actresses. At a more prosaic level, the army's drag net caught all sorts of fish, averaging C in intelligence, but the vaudeville actors averaged only C − while the "artists" (sign-letterers) and "musicians" (band) averaged C +.

The ability to impersonate all sorts of characters is scarcely compatible with the permanent possession of any strong individual character, and is therefore probably not compatible with the possession of a strong and well-balanced intellect. The progress of amateur theatricals now so popular in the United States may throw more light on this point. At present histrionic ability is indicated as not much associated with general intelligence, but associated rather with personality traits and lack of inhibitions that are to a large extent inherited.

In any art the standards of taste are largely subjective, and tastes change; but a book or picture at least exists for the study of successive generations. The actor, on the other hand, is seen by only a few, and his later reputation depends on hearsay, much influenced by press-agentry. Hence it is all the more difficult to draw a sharp line between the sort of talent which history praises and the sort that contemporaries acknowledge by the contribution of adolescent eggs and senescent tomatoes.

So little can be said definitely about the inheritance of literary talent that I omit it here. The many examples of it running in families may prove much, but do not necessarily prove anything. Illustrations like Tom Chatterton are sufficient evidence that the capacity is to a large extent innate. The discovery that a poet is born, not made, was not original with

Q. Horatius Flaccus. Lope de Vega dictated verses at the age of five, before he had learned to write, and his illegitimate son had gained some fame as a poet by the age of 14. Then there is the familiar gibe at the hymn-writer Isaac Watts, who, when a child, worried his mother so much with his incessant versifying that she spanked him to stop the habit: as he felt the impact of the maternal sole he sobbed out,

> O mother, on me pity take,
> And I will no more verses make!

Experiments made in a few modern schools, where children are taught to express themselves in verse, show that ability in this direction is a much more nearly universal possession of the human mind than is sometimes admitted, and that if it is rare in later life it is largely because the educational system succeeds in killing it. The fact that poetry flourishes particularly during the "childhood of the race" may be interpreted in the same way. But the difculty of separating inborn capacities from cultural acquirements is particularly great in the field of literature, and as yet no studies of inheritance have been made that can be considered critical.

V

HEREDITY AND THE AVERAGE LENGTH OF LIFE

That the fountain of youth is just around the corner is one of the most widely heralded of recent discoveries. Man is assured that, thanks to modern medical science, his life is to be immensely prolonged in the near future. Newspaper editorial writers vaguely quote Irving Fisher and Julian Huxley, while they ask whether their subscribers are really ready to use wisely the additional decades that are about to be thrust upon them.

Making the promise more specific, a speaker tells the twentieth annual meeting of the American Sociological Society "that in the year 2,000 A.D., unless we wreck our civilization before that date, many a baby will be born with 200 years or more of life before it; and that men and women 100 years of age will be quite the normal thing, but instead of being wrinkled and crippled they will still be in their vigorous prime."

Such a result would amount to an unprecedented acceleration of evolution; for longevity is an adaptation that fits each species to its conditions of life, removing the adults at a certain time after they have had an opportunity to reproduce.

There has been a gradual evolution in the length of

the pre-reproductive period, since the year 1. A bacterium is ready to reproduce after forty minutes of life, a Ph.D. perhaps not until after forty years, During the course of hundreds of millions of years the general tendency has been, as C. B. Davenport lately pointed out, toward the establishment in mankind of a relatively short uterine period, long childhood, short reproductive period, and long post-reproductive period. But there has apparently not been any very widespread and striking change in any of these respects in historic times, though there have been marked and deleterious changes in them in limited parts of the human race, namely, the most highly educated strata of the most highly civilized nations.

Two or three thousand years ago it appears from the studies of Karl Pearson and W. R. Macdonnell that the expectation of life at birth was ten or twenty years less than at present. At the higher ages, however—say, after sixty—the ancient Roman's expectation of life was probably higher than is that of the American today. This was due to the higher selective death-rate in early life, which weeded out the weakest and left only the strongest to survive. The same factor (and not, as Elie Metchnikoff supposed, the drinking of buttermilk) may produce an unusual proportion of centenarians in a rough country like Bulgaria.

Most of the progress of the medical sciences has

certainly been within the last two thousand years. It appears that it has not increased the expectation of life at birth more than 100 per cent at the most; and that long-lived people actually may not, on the average, live as long as they used to. Hence the suggestion that the average span of life may, in the next two or three generations, be increased some 300 per cent or 400 per cent, involves an unheard-of speeding up of evolution.

Evolution is not a sprint, but an endurance contest. Such bursts of speed have sometimes not been very successful in attaining their goal. One of the outstanding and familiar examples is that of the aborigines of the western hemisphere who, after the arrival of Columbus, tried to cover in a few generations the ground that Europeans had covered in an equal number of millennia, in respect to resistance to certain germ diseases and to alcohol. The effort killed nearly all of them. In some localities, as, for instance, Tasmania, there is literally not a single member of the old native race left.

The practicability of such accelerated progress in the case of longevity is urged by Hornell Hart, on the ground that it can already be demonstrated in other aspects of man's power to control his environment. He cites the development of edged tools, transportation, methods of warfare, and the like. But these are social accomplishments, not phases of organic evolu-

tion. Indeed, the distinction between inheritance and tradition is precisely that in the latter each generation begins where the preceding one stopped; in the former, each generation begins very nearly where the preceding one began.

And human longevity is very definitely an organic, not a cultural, attribute.

As to the exact mechanism by which mankind is to be enabled to take this running broad jump in its evolution, all the evangelists are a bit vague. They merely point to the lengthening of the average span of life, and by projecting this forward can easily, if they desire, prove that the span asymptotes infinity.

When the facts are examined in more detail, it appears that much of this increase in the average duration of life is, in one sense, merely statistical, resulting from a decrease in infant mortality. If a population is made up of one thousand people who died before the age of one, and one thousand others who became centenarians, it is evident that the average duration of life is some fifty years. If the infant mortality is eliminated, the average duration of life is immediately doubled, though the oldest do not live a day longer than they did under the first hypothesis.

The much vaunted increase in the span of life is therefore partly a reincarnation of one of the commonest statistical bugbears, namely, the misinterpretation of the arithmetical mean.

While the infant mortality has been somewhat decreased in most civilized countries during the last generation or two, the actual gain is by no means as great as it is often represented to be. Part of it is a mere bookkeeping gain, due to the better registration of infant births. The usual measure of infant mortality is a fraction, which consists essentially of the ratio of deaths to births. Deaths, which involve an undertaker and a cemetery, therefore some publicity, have always been registered much more fully than births, which commonly occur in the privacy of the home. Even now there is probably no area in the United States which registers as large a percentage of its births as it does of its deaths. But a vigorous campaign by the Census Bureau and many other agencies has resulted in a steady increase in the efficiency of birth registration. This steadily augments the denominator of the fraction, without changing the numerator, and results in an apparent, though spurious, decrease in the infant mortality rate, even if the proportion in fact does not change.

This is frankly recognized by many public health authorities. Thus the California State Board of Health Weekly Bulletin, November 27, 1926, after mentioning the remarkably low infant mortality rates in some cities of the state, continues:

"In some California cities, however, the high infant mortality rates are most deplorable. It would seem

that there is little or no community pride in making an effort to salvage these human lives. Undoubtedly the most important factor in the reduction of infant mortality lies in securing thorough registration of all births. This is obvious when it is considered that the infant mortality rate is the proportion of deaths of infants to the total number of live births. If all births are *not* registered, but if all deaths are registered, the infant mortality rate will of course be correspondingly high. The more thoroughly that births are reported in any community the lower its infant mortality rate will be. Next in importance in the production of a low infant mortality rate is the provision of pure milk supplies," etc.

There has doubtless been some real decline in the proportion of deaths under one year, but this is largely counterbalanced by a corresponding increase in deaths between two and five years—an offset on which the infant welfare agencies do not have much to say. Inasmuch as more than one half of *all* deaths are selective, representing the elimination of the least fit, it would be expected that pulling weak babies through the first year would result merely in saving that many more to die in succeeding years—for by inheritance they are not destined to prolonged survival. The studies of Karl Pearson, E. C. Snow, F. S. Crum, Arne Fisher and others leave scarcely a doubt that this is what happens. A decline in the real infant mortality

rate is always largely offset by a rise in the child mortality rate.

The changes in the adult death-rates are also equivocal. Speaking broadly, it may be said that the tendency in recent decades has been toward a decline in adult deaths due to infectious diseases and an increase in adult deaths due to degenerative diseases. Both these trends seem to be continuing. The increase in the death-rate from diabetes has been much greater than any other.

To bring about a decline in the death-rate from infectious diseases is, theoretically, not very difficult. It involves such theoretically simple measures as the extermination of a certain species of mosquito, or the destruction within the human body of a certain type of microörganism. A continued gain in the war against such diseases might be expected for a long time to come although the evidence in the case of tuberculosis, which has been combated more vigorously than perhaps any other in the last half century, is not altogether reassuring. In any case, a point must eventually be reached at which the gain will become small, or disappear.

The conquest of the degenerative diseases is theoretically more difficult, for it can not be brought about by any simple vaccination. It must be based largely on a change in the living habits of the race, and it is not so easy to get a middle-aged business man to stop eat-

ing and start exercising as it is to clear the hookworms out of his system and immunize him against diphtheria. Conditions appear to be getting worse rather than better, in respect to man's biological habits. While such palliatives as insulin may relieve his sufferings they are, from an evolutionary point of view, merely palliatives. If they change the constitutional make-up of the race, it is likely not to be for the better, since the result is the survival and possible reproduction of persons with weak resistance.

The constitutional make-up is changing in other ways, and it is undoubtedly changing for the worse.

Longevity is well known to be inherited; that is to say, a certain toughness of constitution is passed on from parent to offspring, which enables the survival of the individual even under relatively unfavorable circumstances. On the other hand, even the most favorable surroundings do not insure survival unless one has the constitution. This was well shown by A. Ploetz's study of length of life among the royal and noble families of Europe, where children have at least never lacked for food and medical attention. There was a regular and close association between the parent's length of life and the death-rate of his offspring.

The gradual increase in length of life, in the course of evolution, has presumably been due, at least partly, to the fact that those who lived the longest (thereby showing their possession of unusually good constitu-

tions) also left the largest number of children to inherit and pass on these good constitutions. Karl Pearson first called attention to the correlation between fertility and longevity, which has since been corroborated by Alexander Graham Bell and others.

The "small family system" has knocked the spokes out of this wheel of evolutionary progress. However great the benefits arising from voluntary parenthood, it has often been pointed out that one racial effect is, under present conditions, disastrous. To diagram the problem, suppose that under the old dispensation a vigorous, long-lived couple had ten children, while a couple coming from defective stock, inheriting weak constitutions, and dying young, had only one. This is not so very far from what actually happened in many cases. Evidently people of sound stock would out-number people of weak stock ten to one in the succeeding generation; and the race thus evolved toward increased longevity.

But under the present system, which tends to limit every family, no matter how sound the stock, when the priestesses of birth control warn all intelligent people against "breeding like rabbits," while economic and educational conditions make it easier not to breed at all, the situation is changed. The hypothetical weak couple probably still produces its one child; the strong couple produces not ten children, but perhaps two. Thus the strong outnumber the weak in the

next generation, not ten to one, but only two to one; and the tendency is for the advantage of the strong to decrease steadily.

In other words, the widespread and severe limitation of births in the better educated and economically successful part of the population results inevitably in a decrease, in each generation, of the average fitness of human constitution. It is against this handicap that medical science must work, in attempting to prolong life. While it gains new technical tools in each generation, it at the same time finds poorer material to work on. The proportion of people in the population with good constitutions becomes progressively smaller; at the same time the habits of life, which need the best of constitutions to withstand, constantly become more unfavorable as the progress of so-called civilization takes mankind farther and farther away from the environment to which it is, biologically, still adapted.

Simultaneously, the germinal constitution of the race seems to be deteriorating through the multiplication of sublethal genetic mutations. Experimental breeding indicates that such mutations are occurring continually, though in small numbers, in any stock. Most of them are recessive, and in a state of nature they are probably eliminated almost as fast as they arise, through close inbreeding and stringent natural selection.

In the human species, close inbreeding is almost a thing of the past, and the intensity of natural selection is somewhat lessened. It is therefore impossible to prevent the dissemination of these injurious mutations. They make the race weaker in each generation, and apparently must continue to do so, for there is no prospect at present that medical science can ever succeed in touching them.

Analyzed thus even superficially, the problem of longevity is so involved that it appears to me scarcely to justify the optimism that is sometimes generated very easily in public health meetings.

From the clinical point of view, much can be done in individual cases to prolong life. It is this point of view that seems to have been adopted by nearly all who have written on the subject lately.

From the evolutionary point of view, the picture is not so simple. When the clinician's success is in the field of infant mortality, it tends partly to counteract itself by a subsequent increase in child mortality; and also to increase the average weakness of constitution of the adult population. This weakness is at the same time being increased in several other ways. Sooner than is anticipated, the race may reach the position of equilibrium, when the continuing progress of science will find its counterpoise in the continuing decline of man's inherent fitness.

No matter how great one imagines the future prog-

ress of science to be, it is not likely altogether to abolish natural selection, any more than Einstein's revision of Newton's laws of gravitation enabled his pupils to lift themselves by their own bootstraps.

Until man becomes an angel, he will remain an animal and continue to reproduce organically. It is, then, still open to question whether the average span of life can be greatly and permanently increased by any agency except eugenics.

VI

PROVING PATERNITY BY HERITABLE CHARACTERS

There was a splash in the Landwehr canal, a shout from a passer-by; Berlin police jumped into the water, unmindful of their neatly pressed uniforms, pulled out a struggling young woman, pushed back the crowd which collected, and took their charge to a hospital, where the entry, under date of February 17, 1920, was "attempted suicide."

There were no marks of identity on the girl, and she kept silence. After two months she was committed to the Daldorf Asylum, where she obviously belonged, and where she was listed as "Fraulein Unknown." Her aristocratic bearing excited attention; her complete reserve balked it. Only after two years did she talk to a sympathetic nurse, and then she unfolded a story that might have made the Man in the Iron Mask jealous.

She was, she said, the Grand Duchess Anastasia Nicholaevna, daughter of the late Czar Nicholas II of Russia. When the imperial family was wiped out in the midnight massacre at Ekaterinburg on July 17, 1918, she was taken away for dead, with the others. Being only wounded and stunned, however, she was saved by a young Red soldier, who finally escaped

with her to Rumania, where they lived for nearly two years, and where she bore him a child. After his death she made her way to Berlin, hoping to meet kinfolk and be recognized; but in despondency at her prospects she had attempted to die in the canal.

It was not until 1925 that the invalid's case received further attention—for strange stories are no novelty in a hospital for mental diseases. Then her cause was championed by several people in Berlin, who interested relatives of the Romanoffs, including the royal family of Denmark. The claims of the young woman impressed investigators enough so that she was removed to a hospital in Berlin, and supported for more than a year by the Danish court. Then they withdrew their support, asking the Duke of Leuchtenberg, a distant relative of the Russian monarchs, to give her shelter.

Meanwhile, she was visited by many who had known the Grand Duchess Anastasia in her girlhood. Some identified her, some were doubtful, some denied the identity. The question became involved in the political intrigue which flourished among the exiles from Petrograd. In 1927 the Grand Duke Cyril held an "official" investigation, and reported that the invalid was a Polish German peasant girl suffering from a diseased mind.

Others, presumably impartial, declared this was an absurd political invention, and that there was not the

slightest doubt that the fretful young matron secluded in the obscure Bavarian Castle Secon was in fact heiress to the throne of all the Russias. They pointed not only to the political implications, but to $40,000,000 of Romanoff money supposed to be in London bank vaults awaiting an accredited claimant, as sufficient reason why many members of the family would not care to have a direct heiress appear.

What was the truth?

It is not creditable to civilization that a question of such interest should still be settled by the method of one of Bret Harte's heroines, who, after relating her story to a passing stranger, ended:

"Folks around here say the old man's my father.

"What's your opinion?"

If the footprints of the little Romanoffs had been taken at birth, and the formulae registered in central bureaus, 10 minutes would have sufficed to establish the identity, beyond a doubt, of the unwilling girl who was pulled out of the Landwehr canal. Any reader will call to mind numerous instances similar to this, in which the history of the world might have been changed by the application of scientific methods —which are now, of course, available as they were not in the past. It has been the rule, rather than the exception, that pretenders should arise when a famous person disappeared; and the self-styled Anastasia herself has a rival in a young man discovered in Byd-

goszcz, Pomerania, Poland, who calls himself Eugene Mikhailovitch Ivanov, and is asserted actually to be the czarevitch Alexis, whom he resembles even to having hemophilia. The story is that he escaped the slaughter because the cook's son was substituted for him.

Perkin Warbeck (1474–1499) claimed the throne of England, and found many who believed in his pretension to be Richard Duke of York, supposedly murdered in the Tower in 1483 along with the Prince of Wales (the so-called Edward V). In later times, even such a man of the world as Horace Walpole gave credence to the claim, although the impostor was captured and hanged by Henry VII.

Sebastian, king of Portugal (born 1554) disappeared during a battle in Morocco in 1578. Several impostors arose, of whom one, "The Knight of the Cross," appearing in Venice in 1598, had the Habsburg lip and fifteen other physical marks which, he declared, proved his identity. He was hanged in 1603.

Contests for property have often turned on this point, one of the most famous being the Tichborne case in England, still within the memory of older readers. Although it was at its height half a century ago, the claimant (Arthur Orton, a butcher's son) died only in 1898. Over 100 persons who had known the heir intimately (including his own mother!) swore to his identity. One of the oldest baronetcies in England

was involved, and it is said to have cost the estate $500,000 to defend itself against Orton's claims; with proper registration of the facts at the birth of the heir it would not have cost $5.

But the most interesting, in some ways, of the historical cases is that of the dauphin of France, so-called Louis XVII. This child was born on March 27, 1785. After the execution of his parents, Louis XVI and Marie Antoinette, he was retained as a prisoner in the Temple (a former fortress of the Knights Templar) in Paris, where he was badly treated, and where he was reported to have died of scrofula and neglect on June 8, 1795. It was given out that he was buried in the cemetery of Ste. Marguerite, two or three days later.

There was enough uncertainty about these facts, however, and enough to be gained by denying them, to give rise to a whole crop of putative dauphins, numbering at least thirty altogether, during the next half century. Indeed, the child had as many reincarnations as has "the long-lost Charley Ross." Even America produced a claimant to the throne of France: not "the late dolphin" whom Huckleberry Finn encountered on the lower Mississippi, but a pious Congregational missionary to the Indians (who afterward showed the perfidy expected of royal families by backsliding to Episcopalianism), Rev. Eleazer Williams.

The story is that in 1795 a small party of French people, including a woman who said she had been maid

of honor to Marie Antoinette, and who showed a number of trinkets to substantiate the claim, appeared at Albany, N. Y., with a ten-year-old boy whom they treated with great respect and always spoke of as Monsieur Louis. They disappeared shortly, but a few months later two Frenchmen came to a settlement of the Iroquois Indians and left the same boy in charge of the chief. He was brought up as were the other Indian children; but it was declared that several years afterward two other mysterious Frenchmen came to the settlement, kneeled before the boy, and treated him with all the honors due to royalty.

He was later sent to school and trained as a missionary, and in adult life asserted his supposed identity, but never made any attempt to recover the throne of his supposititious ancestors.

More aggressive was Karl-Wilhelm Naundorf, who remains the chief pretender to the dauphinate, and who succeeded in deceiving many intelligent persons, and perhaps even deceived himself in the end.

This man, born at Potsdam of a Jewish family from Poland, was a clockmaker by trade, and at one time spent three years in prison for counterfeiting. He studied assiduously all the details obtainable concerning the royal family, and when he threw his hat into the ring he had made himself as nearly letter-perfect as any one could. He came to Paris and immediately won a following, being "recognized" by Mme. de

Rambaud, former governess of the real dauphin, and others who knew the Bourbons. Money began to flow to him to establish his pretensions; the French government finally deported him to England, where he lived for several years by the manufacture of fireworks for sale and the practice of spiritualism. Then he removed to Delft, Holland, where he established his court and resided until his death. His tombstone, no more mendacious than many other such monuments, bears witness: "Here lies Louis XVII, King of France."

His son, and later his nephew, succeeded him as "heir apparent", and a great-nephew was maintaining the position there in 1904, when Augustin Cabanès visited him. He was a good specimen of the numerous relicts of near-royalty that exist all over Europe, living on hopes and dupes in a style to which only Tom Sawyer could do justice. Callers were not admitted unless they agreed to address him as "Monseigneur"; but, says Dr. Cabanès, "I was quite surprised—almost disappointed, to find myself facing a man of very vulgar appearance and almost trivial language." What did he expect to find?

As late as 1928 a middle-aged blind man, Prince Louis de Bourbon (*sic*), appeared in Paris and won front-page space, next to almost pure reading matter, by reviving the claim of his ancestor Naundorf. His talking-point was that the opening of governmental archives in several countries, following the World

War, had enabled him to get access to correspondence of the Duchesse d'Angoulême, the Duc d'Orleans and the Duc d'Enghien, which established clearly the legitimacy of the Naundorf pretensions.

The French royal family had sharply defined peculiarities, in common with other Habsburgs, which gave much aid to anyone attempting to prove or disprove a claim to kinship. The only surviving direct descendant was the Duchesse d'Angoulême, sister of the dauphin. She was living at Prag, and Naundorf made many vain efforts to enlist her sympathy. She had the striking face of her mother—a high skull, long chin, and perfectly rounded but protruding lower jaw. The four incisors of her upper jaw, instead of making an arc, formed a straight line.

Moreover, the infant dauphin had a number of peculiarities, described by Mme. de Rambaud and others who had ample opportunity to know. He had the same mouth as the queen, a little dimple on the chin, deformation of the incisors of the lower jaw, the traditional "strawberry mark" on his right breast, and on his thigh "the sign of the Holy Ghost, formed by small veins and representing a pigeon with its wings outspread and head lowered, a mark which of all others could not be imitated."

There was, then, a good deal of material to work on, had it been used by a competent and impartial clinic. But, as I noted above, even Mme. Rambaud herself

acknowledged Naundorf, in spite of the fact that he had virtually none of these peculiarities. He gave out that his eldest daughter, Amèlie, had them; but V. Galippe, who examined the portraits of all his children (they rejoiced in such names as Charles XI, Marie-Antoinette, Adelbert de Bourbon, and Marie-Therèse) says that none of them had any Habsburg characteristics; nor did their children in turn. Yet there are still people in France who are firmly convinced that Naundorf was the dauphin.

An obvious line of investigation was to exhume the body of the real dauphin, and this was first attempted in 1816 at the instigation of René de Chateaubriand, the famous novelist and active royalist, but the remains could not be found. In 1846 another attempt was made, and a skeleton was dug up which was declared to be that of Louis XVII. The report of several physicians did not bear this out—they said it was that of a boy 15 or 20 years old.

Almost half a century later the question was taken up again and further researches made. A lead coffin was encountered which bore the legend "L. XVII" and which contained a skeleton that was thought to be the one discovered in 1846 (at which time it is supposed the lead coffin was provided). Examination was made by L. Manouvrier and other competent anthropologists, who agreed that it was a youth of 18 or 20 years and hence could not be the dauphin. The lower

jaw protruded, however, and had it happened to be that of a 10-year-old child, few would have doubted that it was the skeleton sought. As it is, the remains in question have never been found.

Anthropological evidence of this sort may be good enough to identify a mummy as that of Akhnaton was identified. This pharaoh came of a highly inbred family, and from such traits as the shape of the face, especially the chin, and the teeth, in which he resembled his father and grandfather, it was possible to be reasonably certain of his remains. But it is almost incredible that parents occupying such a conspicuous position as a royal family, or indeed any intelligent parents who are devoted to their children, should not take the slight precautions necessary to furnish these children with proof of identity. As it is, probably the truth about the putative Anastasia (who goes under the name of Fraulein von Tchaikovsky, and who came to the United States in 1928) will never be known beyond the possibility of doubt.

While it is impossible for the student of heredity to say that a given man is the father of a given child, it is not difficult, in some cases, for him to prove either that a designated man might have been, or else that he could not have been, the father of a given child.

This involves examination of the resemblances and differences between parent and offspring. One must make use of traits that are (*a*) sharply defined, (*b*)

little affected by outside influences, (*c*) not subject to falsification, and (*d*), in most instances, determinable early in life. It is a mistake to depend on any one criterion, as some courts lately have depended on the test of blood groups. Approach to certainty is to be had in proportion to the number of traits studied and to the number of generations of ancestry investigated.

The blood-group test is, however, such a simple and useful one that it has been applied in thousands of cases during the last decade—some of them cases that had been settled years previously, but were reopened at the request of a man who declared paternity had been adjudged to him wrongly and asserted that the new tests would prove his innocence.

In one case, identification marks were lost on two newborn babies, and neither family could claim its own. Examination showed the blood grouping to be:

Jones Family	Smith Family
Father I	Father I
Mother I	Mother II
Child I	Child II

Child I could belong to either family, but since child II could belong only to the Smiths, child I must belong to the Joneses.

The test of blood grouping, like any other test, will of course not tell who was the father of a given child; it will show either that he might have been, or that

he could not possibly have been:[1] Its greatest value is therefore negative, so to speak. But, under any circumstances, every unmarried mother should have her blood group recorded at the birth of her child, to aid in establishing the child's paternity in case the question should arise at any time in the future.

In general, the same traits are useful in establishing paternity that are used in determining whether twins come from one egg or two. The alternative inheritance of many abnormalities will occasionally play a part. The remote, as well as the immediate possible ancestry should be studied. Eye color is easy to see, but not definitely fixed in the infant during the early months of life. The direction of the whorl of hair on the occiput, the distribution of the downy hair on the body; the blood groups, the prints of the sole of the foot, of the palm, and of the fingers, microscopic comparison of the capillaries, the form of the ear, x-ray photographs of the skull, together with the more commonly noted traits will often, if properly used, give results with a high degree of accuracy.

[1] There is a legend related by the youthful Roman poet M. Annaeus Lucanus in his *Pharsalia* (A.D. 67) of the Psylli, a tribe living in what is now Libia. Through long exposure, they were said to have become immune to the bite of the asp, and in case of doubt as to the paternity of a child, it was inoculated with the venom of this snake. If it was a true Psyllus, it would be unharmed, whereas if its blood contained an adulterous intermixture from some other tribe, death would ensue. What was the real basis, if any, of this fable?

Not many cases are as extreme, and therefore as simple, as one in which the alleged father of a child had short joints of certain fingers and toes (brachyphalangy). The hands and feet of the child showed exactly the same malformation and x-ray photographs indicated absolute correspondence of the bones in the case of this dominant trait. The man was therefore declared unhesitatingly to be the father.

Such studies should not be left to self-styled experts, in the pay respectively of prosecution and defense, and engaged for mutual contradiction as has been too often the case in insanity hearings. A competent clinic should be designated by the court, and its findings made official.

Lawyers hold that the defendant can not possibly be denied the right to introduce his own experts. However, if, instead of being put on the witness stand for the psychological farce of direct- and cross-examination, the defendant's experts were allowed to consult with the official clinic, the truth would probably be reached in most cases without sacrifice of any one's interests.

All these formalities would be avoidable in most cases, if a print of the pattern of the sole of the foot of the new-born babe were taken (the finger prints of a tiny baby are difficult to get); and for their own protection, parents should insist that this be done. One never knows when absolute proof of identity may be

of overwhelming importance; even the possibility of exchange of an infant is by no means unthinkable. While this essay was being written, newspapers carried a story that, though unusual, illustrates the point. In a reputable hospital, three babies named Brown were born on the same day. Mrs. Sam Brown was told that hers was a boy, and loved it as such, but after a week, being left alone to nurse her offspring, she undressed it and found evidence that it was a girl. The father thereupon brought suit against the hospital, calling for restoration of his son and heir. The interne and nurse who had delivered the baby and announced it as a boy then declared that they must have been mistaken on this point. The ward nurse, who had bathed it three times, said she really had not noticed whether it was a boy or girl. Sam Brown and his wife may go through life with a shadow of doubt always in their minds as to whether the little girl is theirs or not. Anyone else might conceivably have the same experience. When a tray of six or eight babies is pushed down the hospital corridor, each one calling earnestly for nourishment, few parents can identify their own positively. The moral is to make use of the resources of science.

In the last analysis, it is true, the paternity must be settled by what might be called indirect evidence, since the child can not be seen physically tied to the father at any time, as it can be seen tied to the mother

at birth. For this reason, even with the most complete system of birth registration, there will always be need for application of a knowledge of heredity and other circumstantial evidence.

With the maternity this need should never arise, for it is ideally possible to register the baby's identity before the navel cord is cut, and if the mother's identity is registered at the same time on the same card, the problem is settled even beyond the skepticism of a professor (who, according to the German jibe, is "a man who is of a different opinion)."

As sole prints are usually taken, they are smudged so that merely the creases of the foot show, and these change repeatedly in later life. Any bright nurse, however, can become an expert and take the infant's sole print successfully by not using too much ink and not using too much pressure. A piece of glass should be coated with a thin film of ink, by the aid of a rubber roller such as photographers use; then the infant's foot put lightly on it and equally lightly placed on the registration card. The mother's fingerprints, or even a single one—the right index is usual—should be registered alongside, and the problem is settled for all time. The customary string of lettered beads, or numbered strip of adhesive plaster, may be used with this for convenience, but there is no substitute.

VII

SELECTING A CHILD FOR ADOPTION

Most of the children available for adoption fall into three groups: (1) illegitimate children; (2) those abandoned by their parents; and (3) those who have been taken away from their parents because the latter were found unfit by the courts to retain the custody of their own offspring.

It is scarcely necessary to point out that in none of these cases is the ancestry likely to be up to par. The best are sorted out early by the child-placing agencies, in response to the demand for children to adopt, which everywhere in the United States exceeds the supply, girls being most desired. The remainder, collected in orphanages, represent predominantly the inferior levels and usually show up badly in tests. Congenital syphilis is abundant; superior intellect rare. Numerous examinations of the populations of such asylums have revealed that from one-eighth to one-half of the inmates may be classed as "normal." Most of the rest are either mentally deficient or at least backward; there are usually a few above the average, the proportion of these running in some instances as high as one-eighth.

A group of 513 dependent children in Delaware, studied by the Children's Bureau, probably represents

conditions in many other states. More than three-fourths of these came from families in which there were unfavorable conditions, alcoholism and "immorality" being the commonest findings. Only 3 per cent of the children were full orphans; most of them had both parents living but "no account." Three-fourths of the children over seven had themselves records of delinquency.

Special studies made upon illegitimate children harmonize with these findings. An investigation in Boston showed that "at least 19 per cent had a heritage in which there was known or probable insanity, feeble-mindedness, or other subnormal or abnormal mental condition," while mental examinations of a series of unselected unmarried mothers from the obstetrical service of the Cincinnati General Hospital disclosed that "not more than 20 per cent can safely be pronounced normal. From 40 to 50 per cent of the unmarried mothers are almost without question of so low grade mentally as to make life under institutional care the only happy one for themselves, and the most economical and only safe arrangement for society."

Yet in another investigation the illegitimate children were found to be brighter and of better parentage than the legitimate children that were placed out. Among the latter, 89 per cent of the fathers and 83 per cent of the mothers were described as "either mentally or morally defective," as against 31 and 53 per cent

for illegitimates. Of course such figures are not exact, but they confirm the everyday knowledge that children from good homes are not customarily out looking for foster parents.

Reputable child-placing agencies, however, make every endeavor to place children under conditions that will be favorable. So far as possible, those with congenital syphilis are not sent out, unless to some one who understands the situation fully. If the child is old enough to be tested, its mentality is determined and the prospective foster parent advised. Ancestry, tradition, religion are taken into account. Among younger children the agency has little chance to predict intelligence, and its clients seem to attach little weight to this. Most people stipulate that the child they are to take shall be healthy; apart from this they are more concerned about inconsequential and sentimental items than about the fundamental, their attitude in this respect recalling that of many younger persons in selecting a husband or wife. Often a demand is made for a child on the spur of the moment. There is an authentic story of a woman who suddenly decided to adopt a baby shown her, because she thought it "would look so sweet" in a coat she could make from some pieces of left-over white fur. The sweet little thing thus adopted now has an IQ of 72.

A distinguished physician who is one of the most active men in the United States in promoting adop-

tions describes the situation gleefully. "People come up looking for girls," he says. "Of course they must all be golden-haired, blue-eyed, with dimples, impeccable ancestry and sweet dispositions. But all we do is to take the prospective parents up to the nursery, and some child holds out its arms to them, and it may be a black-haired boy picked up in an open lot somewhere, but they say, 'That's the baby I want.'"

A child who is placed in a foster home after the age of four or five knows, of course, that it is not his real home. Those placed earlier may not know unless told. In a New York investigation, half of the children placed under five were kept in ignorance of the foster relationship, while in a California investigation which dealt only with those adopted as infants, two-thirds were ignorant. In this case, it was found that the most intelligent parents were the ones most likely to tell the child the truth.

Although hundreds of children are being placed out each year by scores of agencies, some of these show little concern over the future of their charges. They prefer to content themselves with pious hopes and fervent affirmations, and cite a few striking instances to justify the claim which most of them make, explicitly or implicitly, that any child will turn out well if given a proper home.

Such an exceptional child was probably the offspring

of the black sheep of some able family. While his own parents may have been of little value, or even a detriment, to the community, they were yet able to transmit to their offspring good qualities which did not appear in their own lives. Thus one would expect, in a large group of dependent or illegitimate children, to find a few who carried some really good traits. There are a few other cases where a child of superior parents is set adrift for some unusual reason. Moses is the classical example, but Sargon I, king of Babylonia (2637–2582 B.C.), has almost identical childhood history and is an equally striking case in point.[1]

These isolated cases are easily matched by equally isolated and striking cases to the opposite effect, such as two boys (reported by L. M. Terman) adopted at the ages of five and seven from a very poor home. Their IQ's were 72 and 73. Four years later, after exceptional advantages, their IQ's were 70 and 77.

So far as I am aware, only one agency which places

[1] The number of legendary worthies whose supposed parents were not their real parents has aroused the ready suspicion of the psychoanalysts, and they have described "The Birth of the Hero" as one of the universal myths, based on an equally universal tendency of children to fancy, in their day-dreams, that they are not the offspring of their putative parents, but are really of nobler lineage. Questionnaires reveal that a large proportion of the population does, in fact, recall having such childhood fantasies. The number of histories comparable to those of Sargon and Moses can be multiplied readily by any one with a knowledge of ancient literature.

children has made any determined effort to find out how its children turn out. This is the State Charities Aid Association of New York, which published in 1924 a report on the history of 910 of its children. Briefly, it found that six out of every eight have "made good" in the sense that they have at least been able to manage their own affairs with ordinary prudence and live in accordance with the standards of their own communities. The seventh has turned out to be incapable but "harmless;" the eighth, definitely bad.

Although three-fourths of the children are thus alleged to have become reasonably good citizens, this fact is not quite so encouraging as it appears at first sight to the family which contemplates taking in or adopting a child (only 269 of the children in this group were legally adopted), for the fact is that some of them had to go through two, three or more homes before they found one in which they could live satisfactorily. There were 1,621 homes used for the 910 children. In only 60 per cent of the homes did the child turn out satisfactorily. It thus appears that the family contemplating taking in a foundling has a little better than an even chance not to regret the act.

Moreover, it must be remembered that this particular agency, which is one of the largest in operation, probably sifts its children with unusual care, to eliminate defectives. A smaller agency run with less efficiency and more sentimentality would be likely to

place many children who were even less favorably endowed.

Furthermore, the children included in this study were in some cases still young—nearly half were minors. It is obvious that their "success" at the age of eighteen is not final, since they are mostly still under the control of their elders. The child who appears at eighteen or twenty to be behaving well may at twenty-eight or thirty tell a different story. At the lower age he is either still dependent or is just releasing himself from his dependent status. What will happen ten or twenty years later, when he is married, has more children than he can support, loses his youthful ideals, ambition and self-confidence, and begins to think that "the world has it in for him" and that it is no use to try to be a good citizen, since the ones who get ahead in life are merely the crooks who are clever enough to avoid detection?

It appears, then, that this study can not be taken at its face value; that the facts are probably not so favorable as appear from it.

Looking at the details more closely, one learns that the child placed in a bad foster home is just about as likely to turn out well as is the one placed in a good foster home. Even the worst parental home, it seems, is better than the best orphan asylum, if the child's future success in the world is the standard of measurement. These are striking and almost unpre-

cedented findings, which need a good deal of substantiation before they will be accepted without question. The studies quoted later in this paper show that foster children put in good homes frequently made definite, sometimes relatively large, gains in IQ. The home brought out the best that they had in them. On the other hand, two groups of girls taken from bad surroundings and put in unusually good institutions failed to show any such advance. In another case, involving only six girls who were put in a very superior institution on the cottage plan, the average gain was but five points, and one showed a marked loss. Among one hundred children in two German orphanages, there was no relation between the level of intelligence and the length of time that the children had spent in the institution. Brothers and sisters are not made any more alike intellectually by being kept in an orphanage for years.

In all these instances, the institution was doubtless much more impartial, much more efficient, much more hygienic, much more "scientific" than the home. But it failed in comparison with the home because the latter apparently provided something necessary for child development which the former could not furnish. A consideration of this fact is recommended, in passing, to those who think that the old-fashioned family is an obsolete institution, and who look forward to a time when the state will assume the care of all children

as soon as they are weaned, thereby setting parents free for "careers."

What, then, in the light of the New York report, makes the difference between the child's success and failure in a foster home? Two factors are named: (1) early placement, and (2) a sympathetic relationship with the foster parents. To some extent (2) is merely a phase of (1). This report, then, puts almost the entire weight of the child's success on being adopted young.

Important as this fact is, few will believe that it is strong enough to support the entire weight of the superstructure. When one looks more carefully at the figures, one finds that of full brothers and sisters, put into equally suitable homes so far as one can judge, 40 per cent turned out quite differently from each other. Here is the factor of heredity, of which the report had previously lost sight. The parental traits segregate out in the children; some get more than their share of the good ones (and it is scarcely necessary to remark that even the worst family has a few good traits); some get more than their share of the bad.

The conclusions of the study just mentioned are borne out, in part, by two particularly careful studies, one in Illinois (Frank N. Freeman, *et al.*) and the other in California (Barbara S. Burks). These were con-

cerned primarily to find how far the child's general intelligence could be brought up by good surroundings.

The Illinois study is the most nearly comparable with that of the New York agency, for it dealt with children placed out at all ages. The conclusion it reached was that early placement and a good foster home were the most significant features in permitting a child to do his best. Although the background of the children was bad, it was found that in good homes there were few serious cases of misbehavior.

The California study is particularly interesting in dealing only with children placed as babies—all of them under one year of age and most of them at about three months. It therefore had an ideal opportunity to measure the total effect of environment acting after birth. It appears from this study that all of the factors of home environment taken together account for something like 17 per cent of the differences in intelligence among children. The total contribution of heredity seemed to be about 75 or 80 per cent. The small remainder must be assigned to the sort of chance and accidental influences that are always present in development.

Of the influence assigned to heredity (75 to 80 per cent), a third was allotted to the parents. The rest belongs to the more remote ancestry. Usually, the influence of the parents is thought of, and properly so, as including also that of all their progenitors; but if

one is making a separate study of the various influences that account for the differences in IQ among children, it is legitimate to attempt to apportion the responsibility in more detail, as in this instance.

This study also gave an almost unique opportunity to determine how much an IQ could be changed by the greatest possible improvement or impairment of the environment, acting from birth onward. The conclusion was reached that in such extreme conditions, it might be altered as much as twenty points, but that such extreme conditions would not be reached in more than a home or two in a thousand. Rough as the present methods of measuring mental traits are, then, they do succeed to a useful degree in getting at the real innate intelligence of a child; and 70 per cent of the average run of school children have an actual IQ within six to nine points of that represented by their innate intelligence—that is, any changes in the ordinary conditions of life would not change the IQ more than six to nine points.

The California study, like others, supports the view that traits of personality and conduct are much more subject to influence from outside than are traits of intellect or physique. They represent social much more than biological aspects of life.

The three studies cited above give, for the first time, a scientific knowledge of some of the results of child adoption. They agree with common sense in

showing that a child will do better with every assistance and sympathy than he will do with everything against him; they agree with the conclusion now widely accepted that the conduct of a child is something for which the parents themselves must take the responsibility—they can not blame their great-grandparents for it. But they all have the serious defect that they do not go much beyond the adolescence of the adopted child. What will happen when this child grows up?

Apart from the interests of society, which are a matter of eugenics, there are two interests to consider: that of the foster parents and that of the foster child.

1. The foster parent desires a child to comfort his declining years; to bring the happiness into his life which only a child can bring. What chance has he to realize this hope by adopting one? As parents go, the chances appear from the New York study to be about even that the child will make him happy, or unhappy. Wise parents will do better than this; but not all parents are wise, especially when parenthood does not come to them until late in life, and then comes only in an artificial way.

The important points seem to be:

a. To pick out a child with as good ancestry as possible. Bad as the ancestry of illegitimate children is, it has been pointed out above that it is likely to be better than that of legitimate children of the sort that

are thrown on the market for adoption. The chief difficulty is that the ancestry is not so easily learned. But the mother is always known, save in the case of foundlings; and while she may conceal the paternity, either because she really does not know, or because she wants to protect the man, his identity can usually be ascertained with a little effort. A knowledge of the ancestry will tell what strong points the child is likely to have which can be developed, what weak points call for continual caution.

b. The child should be taken young. Here again the illegitimate child has the advantage, for he can usually be gotten much younger than the legitimate child—many maternity hospitals make it a point not even to let the illegitimate mother see her child, if it is to be taken from her and brought up by others. An incidental advantage is that the real parents of an illegitimate child are less likely to make trouble, either for the child itself or for the foster parents, in future years, than are the parents of a legitimate child. One of the chief disadvantages of taking a child very young is that the presence of congenital syphilis is not quite so easily ruled out. Wassermann tests on the baby are not always dependable, nor are those on a pregnant woman, at least as ordinarily made. Here again a knowledge of the ancestry is a safeguard.

c. The child should be taken only on trial. Many agencies have a fixed period of one year of probation

before a child can be adopted, and in some states a legal adoption may be voided at any time within five years, if desirable. This is a valuable provision for the protection of the child as well as the parents.

2. The interests of the child are to get the best home possible, and to have the best possible chance in the world. It therefore makes less difference to him if he has to go through four or five homes to find the right one, even though he may have left broken hearts in the others.

On the other hand, it is possible for a child to have too good a home—not merely in the very common sense, in which he has life made too easy for him, as people often make it too easy for their own children; but in the sense that he has a better home than he can live up to. Almost any principal of a private school which receives the children of the leisure class can tell of the differences in ability between the foster children in the school and those "to the manor born." The latter are distinctly beyond the averages of their ages in brightness. The foster child represents a different ancestry; no matter how early he has been adopted and how carefully he has been schooled, he may not be able to make up the difference; he can not compete on even terms with those who started with a better endowment.

The result is that the foster children in such a group, though surrounded by every encouragement to suc-

ceed, contrast badly with their associates. They themselves feel this contrast more vividly than any one else, and a common result is the production of an inferiority complex, a feeling of baffled helplessness and resentment, which is likely to lead to a failure of mental adjustment.

Finally, it is not to the interests of the child to make a good marriage and produce defective children. He should at least be warned in this respect, even though the knowledge of the facts of his ancestry may cause pain. It is generally recognized by thoughtful students, I believe, that the child should not be allowed to grow up with the supposition that he is actually the offspring of his foster parents; that the fact of legal adoption, which Henry Maine called "the most violent of fictions," should not be converted into a real lie. The foster child faces in this respect a dilemma, both horns of which are certain to wound deeply. But it can not be escaped.

Any one who thinks eugenically will not want to see the lines of descent falsified by a concealed adoption, and such concealment will probably only store up trouble for the child in years to come.

By a favorable combination of circumstances, some of these children with defective heredity have themselves largely escaped the consequences. They are carrying genes of worse traits than those which are openly expressed in their minds and bodies. These

will appear in their own descendants, to the great chagrin of all concerned. These children can not marry wisely in the future without knowing their own ancestry. They can not even avoid the possibility of incestuous matings; and although incest has no biological significance other than that of consanguineous marriage in general, the strong social tabu against it is based on cogent grounds. A young man who fell in love with Ninon de l'Enclos committed suicide when he learned that she was really his grandmother. To give him the benefit of the doubt, however, perhaps he killed himself not from chagrin at making love to an ancestor, but at having such an ancestor. Anyhow, for the child's own benefit as well as that of society, every effort should be made to get at the truth of the heredity, and this should not afterward be concealed or misrepresented.

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Sans Tache

Sans Tache

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